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ANALYSIS AND USE OF AIR FORCE BASE LEVEL SUPPLY MANAGEMENT INDICATORS

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LSSR 18-81

JUN 1981

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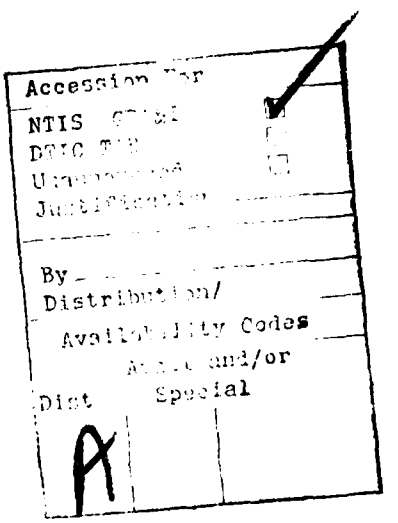

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This thesis defines the objectives of a base supply management analysis program and how management indicators should be used in the program. It also identifies and explains a set of common management indicators and action to be taken when the indicators reflect unfavorable trends. Sixteen management indicators were analyzed in the study and they represent a broad cross section of the base level supply operation. The thesis should provide a valuable management tool for supply managers newly assigned to the supply career field.

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ANALYSIS AND USE OF AIR FORCE BASE LEVEL SUPPLY MANAGEMENT INDICATORS

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

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In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

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CHAPTER I

INTRODUCTION

Background

The Air Force mission is supported by a complex and dynamic supply system. The system is separated into wholesale and retail levels with the Standard Base Level Supply System (SBSS) providing the retail level support. At this level items of supply and equipment are issued to the customer to provide the items necessary to ensure mission accomplishment. The SBSS provides support through the balancing of environmental constraints to achieve optimal customer satisfaction. In simpler terms, this is having the correct item on hand and delivering the item within the required time to meet customer needs.

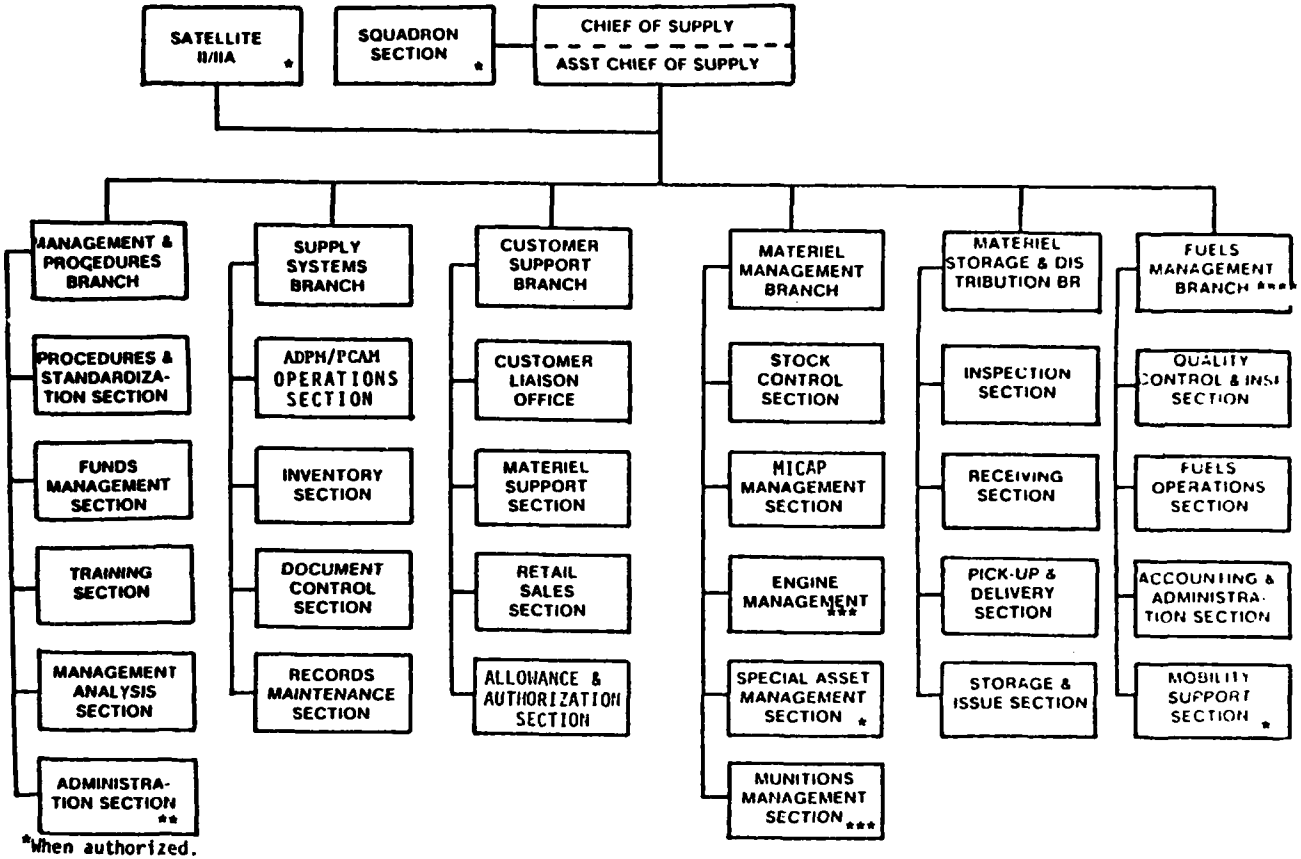
Each SBSS has six standard functions. The requisitioning function entails the acquisition of stock for inventory in anticipation of customer demands. The adjustment function requires changes to internal accounting records to record transactions. The receipt function encompasses the inspection, identification, and warehousing of property received. The issue function entails issuing of property to the customer in the correct quantities. The shipment function includes lateral support transfers of property to other bases, evacuation of reparable assets, and return of

excess items to the depot. The turn-in function includes the verification of the condition of the property being returned by the customer and determination of the level of repair required if repair is feasible (16:5).

The complexity of the SBSS can be seen from the previous discussion. To accomplish these various functions, an elaborate organizational structure has been developed (see Figure 1-1). At the head of the organization is the Chief of Supply. He is the accountable officer and is responsible for the supply support provided to the base. He has in his organizational structure six branches headed by either military officers or civilians.

The Materiel Management Branch functions include the effective and efficient management of all items of supply and equipment. These functions include determining stock requirements, requisitioning of stock, controlling War Reserve Materiel, managing all jet engines on the base, and controlling base munitions, if applicable (28:p.2-31).

The Customer Support Branch is the primary point of contact for the supply customer. Its functions include customer liaison, receipt of customer requests, operation of a retail sales store, management of bench stocks and reparable assets, and control of all equipment used on the base (28:p.2-33).



*When authorized.
**May be consolidated with Squadron Section if facilities are appropriate and at option of Chief of Supply.
***Authorized only when accounts are officially designated and when it is not assigned to another base organization.
****At MAJCOM option, bases with ground fuels only may have a Fuels Management Section in Customer Support.

Fig. 1-1. Chief of Supply Organization Chart (28:p.2-43)

The Supply Systems Branch is primarily responsible for the operation of the UNIVAC 1050-II computer system which supports the base level supply account. Also included under this branch are the inventory section, the document control section, and the records maintenance section (28:p.2-36).

The Materiel Storage and Distribution Branch handles the warehousing and delivery functions of a supply account. This includes receipt and inspection of materiel, storage of materiel, and delivery of materiel to the customer (28:pp.2-37 to 2-38).

The Fuels Branch handles the receipt, storage, and issue of all fuels used on the base. These fuels range from gasoline used for automobiles to jet fuel used in aircraft (28:p.2-38).

The Management and Procedures Branch is what has been termed the "watch dog" of the supply account. It performs quality control and inspection on the other branches along with other responsibilities. This branch handles all training requirements and controls funds for the stock fund operations. An important section of this branch is the Management Analysis Section. This section, through its analysis program, keeps the Chief of Supply informed on the operation of the base supply complex and identifies unacceptable performance variances and corrective action needed to

resolve deficiencies. This section was created in 1977 (28:pp.2-28 to 2-29).

A system as large in scope and complexity as the Standard Base Supply System inevitably has problems. These problems derive from a number of factors:

1. The magnitude of the supply system. Any operation of this size is extremely difficult to manage.

2. The complexity of the supply mission. The SBSS is a major part of the total mission support and it must satisfy the needs of a wide range of specific customer requirements for highly technical weapon systems and other supply and equipment needs.

3. The factors of change. The SBSS must be capable of providing the needed support for new weapons and systems which are constantly being developed. The system requires flexibility to adjust to the tactical and strategic concepts which dictate the manner in which supply support will be accomplished (26:p.1-2).

There is a trend within the supply officer career field, AFSC 64XX, toward a low level of officer experience. Presently, of 1300 authorized supply positions Air Force wide, there are 461 (35%) lieutenants, rated supplement, or career broadening officers assigned. These officers are assigned to management positions within the Standard Base Supply System and, in some instances, rated officers are assigned as Chief of Supply. Since the entry level Supply

Operations Officer Course, G30BR6421, provides little training in the use and interpretation of management indicators used in a supply management analysis program, there is a definite lack of knowledge by new personnel in this area. In some cases, supply officers do not attend this initial course.

Air Force Major Commands have developed and use base level supply management indicator systems as part of their management analysis program to evaluate the operations of their base level supply accounts. Yet, few commands provide guidance as to interpretation of the indicators used and corrective action needed when the indicators reflect an unfavorable situation.

Problem Statement

There is a need for a comprehensive handbook of common base supply management indicators to be used by new supply officers which discusses definition and interpretation of the management indicators and corrective action to be taken to correct unfavorable situations.

Scope

The scope of the thesis will be limited to Air Force base supply accounts operating under the Standard Base Supply System using the UNIVAC 1050-II computer system within the continental United States. Management indicators from four major commands--Strategic Air Command (SAC),

Military Airlift Command (MAC), Tactical Air Command (TAC), and Air Training Command (ATC)--will be reviewed and a set of common management indicators will be identified and evaluated.

Research Objectives

The objective of this research was to develop a basis for a handbook to accomplish the below:

1. Define the objectives of a management analysis program and how management indicators should be used in the program.

2. Identify and explain common management indicators used.

3. Identify management actions to be taken when the indicators reflect unfavorable situations.

Research Questions

1. What are the objectives of a management analysis program?

2. How are management indicators used in an analysis program?

3. What are the common indicators presently being used?

4. What are the formulas used to compute the indicators?

5. What action should management take when the indicators reflect unfavorable situations?

CHAPTER II

LITERATURE REVIEW

Having defined our problem, research objectives, and research questions, our goal for the literature review was to determine what other authors had written concerning management information systems, management analysis, and management indicators. The intent was to look at the broad theoretical perspectives of each of these areas so that this theory could be applied to our specific research. The information gained from the literature review will enable the researchers to be constantly aware of the requirements needed in development of management indicators for a base level supply management analysis program.

Management Information Systems

Colonel John E. Dickson, Jr., in writing Air Force Management Information Systems, defined an information system as:

> . . . the procedures, methodologies, organization, software, and hardware elements needed to insert and retrieve selected data as required for operating and managing a company [5:92].

Department of Defense Directive (DODD) 5000.19, Policies for Management and Control of DOD Information Requirements, further defines an information system as an orderly, documented procedure for providing management the necessary

information for evaluating the effectiveness of present policies and accomplishing the objectives of the present policies. The directive also emphasized the use of information in the evaluation of policy changes (34:Enclosure 2).

James J. O'Brien, in his book, Management Information Systems: Concepts, Techniques and Applications, described the necessary structure in development of a MIS. He stressed that a prerequisite for a successful MIS in the definition of goals of the organization (12:13) and the orientation of the information obtained from the MIS toward the needs of management (12:61-62).

William I. Spencer, in his article, "What do Upper Executives Want from MIS," further emphasized the need for orienting the MIS should provide

> . . . Top management with (1) the information to exercise control over operations, (2) early warning of developing problems, (3) enough data on non-routine problems to indicate action required, . . . and (5) adequate information to allocate resources [14:27].

In their technical report, "Spinning Our [Informational] Wheels: A Look at the Maintenance Data Collection System," Majors Richard V. Badalamente and Thomas D. Clark discussed the three types of decisions made in all organizations. Strategic decisions deal with the overall plans, objectives, and goals of the organization. Managerial control decisions are related to acquisition and control of resources. Operational control decisions relate to the day-to-day decision to implement policies and plans (3:14).

They stressed the importance of orienting the MIS towards the organizational level of use. Information needs for each of the decision levels of strategic, management control, and operational control will vary. They believe the key to solution of problems in the Maintenance Data Collection Systems lies in ensuring information is effectively defined and oriented towards the organizational and decisional structure for which it is intended (3:22).

Once information from a MIS has been defined and oriented towards the user, another area of concern is how much information is enough. An individual is only able to absorb and comprehend a certain amount of information. Once the individual has reached his saturation point, any additional information is excessive and wasteful. Also, the information must be presented in a usable format. Colonel Dickson gave two guidelines concerning the amount and format of information:

> (1) Exercise "conservation of data"; that is, require the system to process and display the absolute minimum to accomplish your task. To require non-essential or extraneous information will result in data "glut," which most likely will result in a product that is cumbersome or unusable in its primary function of aiding in decision making.
> (2) Have the data presented in a format which is simple, immediately recognizable, and devoid of unnecessary frills and embellishments [6:96].

The primary purpose of a MIS is to provide information for management decisions. In doing this, the MIS must orient the information to the organizational level using the information. The information should be only the minimum

amount needed to make a decision and in a usable form. If these three criteria are met, the MIS will provide the necessary information to be utilized in a management analysis program.

Management Analysis

Once information has been obtained, the management analysis program can begin operating. Air Force Pamphlet (AFP) 178-2, Wing/Base Level Management Analysis, defines management analysis as a

> . . . system designed to prepare analyses and make presentations of summary data in order that the commander and staff may be provided with information by which they can better manage the operation of the unit as a whole [33:6].

Management analysis is a program of review and analysis which compares actual performance (using data obtained from the MIS) with planned performance and determines the causes of deviations between planned and actual performance. Once deviations are determined, they should be reported to management so corrective action can be taken.

Management analysis is essentially a control system. Richard A. Johnson, Fremont E. Kast, and James E. Rosenweig, in their book, The Theory of Management of Systems, discussed four essential elements in a control system. The first is a characteristic or condition to be controlled. This would be the variable to be measured and the performance standard associated with that variable. A second essential element is a sensor, which is a way to sense or measure the variable

to be controlled. This is a management indicator and will be discussed later in the literature review. A third element of a control system is a comparator which compares actual performance with the plan or a standard. A management indicator also fulfills this requirement. The final element required for a control system discussed by the authors is an activator. This is taking corrective action to eliminate the deviation between actual performance and the standard. These elements must be present in any effective management analysis program (8:75).

AFP 67-2, Supply Management Reference Book, discusses the steps required in the management analysis process: (1) obtaining information, (2) analyzing information, (3) reporting information to management, (4) and follow-up corrective action (26:p.26-2). The basic ingredient of an analysis program is reliable and valid information. This information is obtained from the organization's MIS. After the information has been gathered, it must be analyzed. Analysis entails comparison of actual performance to the standard. An important aspect of analysis is the idea of management by exception. Management attention should be directed to areas in which actual performance exceeds some predetermined acceptable range around the standard. This allows concentration of effort on areas of greatest concern. After information has been analyzed it must be reported. This reporting is required to allow management to make

accurate decisions. AFP 67-2 discusses six factors important in reporting:

> 1. Point out the meaning, significance, and relationships of events rather than merely recite statistics.
> 2. When problems surface, state what action has been taken to solve the problems or provide recommended solutions.
> 3. If improvements are shown, state reasons for the improvements.
> 4. Provide only the facts which are essential to the message.
> 5. Indicate adequacy of actions taken to correct previous problems.
> 6. Express the message as simple as possible [26:p.26-3].

The final area of the analysis process is follow-up on corrective action. This entails determining whether the corrective action used solved the problem and, if not, then what other action should be taken.

Major Merle P. Martin, in his unpublished Analysis of the Standard Supply System, discussed what he believes are the objectives of any management analysis system. The information used in any analysis program must be valid and readily available. To be valid, the information must accurately measure when there is a problem in the area being studied. He stated that often the best indicator that might be of use is not readily available or measurable. He gave, as an example, that "one of the better indicators of the state of the warehousing function is the cleanliness of the housekeeping. But there is no statistical data available to measure this factor [11:5]." He went on to say that a management analysis program should be selective. The

program should highlight specific problem areas as opposed to a detailed review of the entire program on a continuing basis. This supports the management by exception principle stated earlier. He concluded by stating that a management analysis program must communicate. The output of the program must be understood by the user and the function being measured (11:5).

In pulling together the literature reviewed on management analysis, it appears the predominant theme of an analysis program rests on three steps: (1) acquire the information which is accomplished through the MIS; (2) analyze the information; and (3) recommend corrective action to eliminate deviations. Analysis of the information is accomplished through the use of management indicators.

Management Indicators

AFP 67-2, Supply Management Reference Book, defines a management indicator as

> . . . a performance measure which has been determined to represent a key result and which is selected for monitoring at staff and command level incidental to the system for management control [26:p.26-1].

The important terms in the definition are "performance measure" and "key result."

A performance measure compares actual performance to planned performance in relation to the objectives or goals set by the organization. Dr. Robert N. Anthony and Regina Herzlinger, in their book, Management Control in Nonprofit

Organizations, recommended that performance indicators be patterned after the goals of the organization. They suggested that indicators can take on many forms. They can be quantitative of qualitative; subjective or objective; and discrete or scalar. They also stated that indicators may be classified three ways. Results measures compare output related to objectives. Process measures evaluate output but do not relate output to the organization goals. Social measures, which are only rough indicators of performance, include factors outside the organization, and tend only to relate to broad overall objectives of the organization (2:138).

Leon N. Karadbil and others, in a research report, Logistics Performance Measures at the Intermediate Level, discussed some of the attributed needed for performance measures. They suggested that performance measures must be realistic in attainment but also allow for improvements. Further, performance measures should be stable but yet provide enough flexibility to enable them to adjust to changing conditions. Some provision should be made to periodically review the measures to ensure they are still applicable (9:18). Performance measures can be used:

> 1. To express a level of performance that is deemed reasonable wherein the quantity of work is considered as the expected normal performance.
> 2. As a basis for comparing performance and deviations from established standards [9:18].

Another important part of the definition of a management indicator is a "key result." John F. Rockart, in his article, "Chief Executives Define Their Own Data Needs," discussed his recommended best approach to determining management information requirements. He calls his approach the key indicator system, which is based on two concepts. First, indicators must be selected which accurately portray the condition of the organization. These are the key indicators with which overall performance can be measured. Second, a management by exception principle should be utilized in reporting and evaluating information (13:83). The concept of key result recognizes the problem of information overload and the need to limit the number of management indicators used in any analysis program.

Robert Albanese, in his book, Managing: Toward Accountability for Performance, believes management indicators should be established with control tolerances. He recommended an upper control limit and a lower control limit be established around the standard. These limits establish the normal operating range within which performance can deviate and still be considered in compliance with the standard (1:130). This is the establishment of an acceptable performance range and is the basis for the use of management by exception in evaluation of the output of management indicators.

The literature summary review was directed into three areas. Management information systems were reviewed as these systems provide the information which is utilized in any management analysis program. The field of management analysis was reviewed with emphasis on the objectives and structure of a management analysis program. Finally, management indicators were studied. These indicators are the measurement tools used in the analysis program. The intent of the literature review was to provide the authors a foundation for developing management indicators for a base level supply management analysis program.

CHAPTER III

METHODOLOGY

Overview

This research is directed to establishing a basis for a handbook of base level supply management indicators. The key to the process appeared to lie in a review and synthesis of information available at the present time. Four major commands--Strategic Air Command (SAC), Air Training Command (ATC), Military Airlift Command (MAC), and Tactical Air Command (TAC)--were questioned as to the management indicators presently being used in their commands. From the list of indicators presently being used, 16 indicators were chosen to be studied. It is the opinion of the authors that the indicators chosen are representative of the various indicators used by the four commands and may be referred to as common management indicators.

Common Management Indicators

In developing the common management indicators, two factors were considered. The first factor was based on what indicators were presently being used. This was discussed above. The second factor concerned how many indicators to study. Too many indicators for any analysis program would be cumbersome. Yet, enough indicators should be analyzed so

as to present a review of the entire spectrum of the supply operation. The indicators used in this study represent a broad cross section of the entire supply operation, yet in the opinion of the authors, do not entail an excessive number.

The indicators chosen were incorporated into six support categories. The categories with specific indicators are listed below:

1. Stockage Support Indicators
    a. Stockage effectiveness
    b. Item records with a requisitioning objective and zero assets
    c. Bench stock due-out rates
    d. Excess inventory
2. Not Mission Capable Supply Indicators
    a. Not mission capable supply rates
    b. Mission capable cause code analysis
    c. Mission capable deletion code analysis
3. Priority Support Indicators
    a. Priority due-outs
    b. Priority requisition rate
    c. Urgency of Need A and B due-out cancellations
4. Warehouse Storage Indicators
    a. Serviceable balance with no warehouse location
    b. Warehouse refusals

c. Overall inventory accuracy

d. Item records past due inventory

5. Repair Cycle Asset Support Indicators

6. Computer Utilization

Application of the Methodology

This section of the methodology contains a definition and discussion of the population studied and the data analysis plan. The data analysis plan discusses the methods to be used to answer each research question.

The Population

The population consists of the common base level supply management indicators for bases belonging to four major commands--SAC, TAC, ATC, and MAC. The population is further defined as these bases which utilize the Standard Base Supply System (SBSS) and are located within the continental United States. The reason for the selection of this population was due to the common operational support mission for the four major commands.

Data Source and Analysis

Data for the study was obtained from three sources. The four major commands in the study were queried to determine the management indicators presently being used. These are listed in Appendix C. The Air Force Data System Design Center provided fiscal year 1980 data from the Monthly Base Supply Management Report, M32, for the four major commands.

Appendix B contains the data accumulated for the commands and by management indicator analyzed in this study. This data provides real world examples to aid not only in the analysis of the indicators but to provide local bases general guides in establishing their local standards for management indicators. The final source of data was the numerous volumes of Air Force Manual (AFM) 67-1, Air Force Supply Manual. AFM 67-1, along with the supply experience of the authors, was used to analyze the management indicators.

How the Research Questions Were Answered

Question 1: What are the objectives of a management analysis program? The answer to this question was obtained from the literature review. Emphasis was placed on a base supply management analysis program using HQ USAF/LEYS letter, Base Supply Analysis Capability. This letter is a proposed revision of AFM 67-1, Volume II, Part Two, Chapter Two, concerning the base supply management analysis function.

Question 2: How are management indicators used in an analysis program? The uses of management indicators were determined using the same analysis indicated in question 1. The indicators were portrayed as measurement tools with which overall performance can be measured, potential deficiencies identified, and corrective actions recommended.

Question 3: What are the common indicators presently being used? Due to the variety of representation of indicators used by the four commands, common indicators were

selected by the authors using the data collected and the M32, Monthly Base Supply Management Report (28:pp.24-265 to 24-320H).

Question 4: What are the formulas used to compute the indicators? This question was answered from the formulas used in AFM 67-1 and/or in the data submitted by the four major commands.

Question 5: What action should management take when the indicators reflect unfavorable situations? Recommended management actions were determined after an analysis of the indicators. Sources used to determine the validity of the management actions are AFM 67-1 and experience of the authors.

CHAPTER IV

DEVELOPING A MANAGEMENT ANALYSIS PROGRAM

Objectives of an Analysis Program

An effective management analysis program must be based on and serve the objectives of the organization. Only after the organization objectives have been established can the objectives of a management analysis program be established. Base level supply management analysis programs are no exception to this general rule. The objectives of a base level supply organization are many times given the nebulous description of "maximum customer support." While this is by no means unimportant, the organization objectives should be more specific. Better customer support might entail a 90 percent overall stockage effectiveness or a 5 percent Not Mission Capable Supply (NMCS) rate. The point is that these objectives should be more specific than just "maximum customer support."

Determination of the objectives of a base supply squadron should not follow an arbitrary "top-down" approach. It is important that personnel within the squadron have an input into establishment of the objectives. Even though the squadron is a military organization and personnel are accustomed to a top-down flow of decisions, real support of organization objectives can be better achieved through a participative determination of objectives. Personnel may

support objectives which are arbitrarily determined but this support may be simply "going thru the motions."

Wealth of experience is another reason to obtain input from organization personnel in setting objectives. Most supply squadrons have a core of experienced noncomissioned officers (NCOs) and civilian personnel. A broad scope and in-depth level of experience can be provided by these groups. The senior NCOs may have completed many assignments, in different commands, with varying missions that will provide a broad experience base. How many times has the comment "when I was stationed at base "X" in 1968 we had this same problem and this is what we did about it" been heard? The stable civilian force which exists in most supply squadrons can provide the in-depth knowledge of years of experience in the same job. Don't overlook these personnel when setting organizational objectives.

Once objectives have been determined, they must be communicated to be effective. This communication must be clear, concise, and reach all the people in the squadron. This can be done in several ways. Objectives could be communicated at a commanders call to which both military and civilian personnel attend. The objectives could be published and copies given to each person. Another way which would serve as a continual reminder to personnel would be to have objectives prominently displayed on the wall in the work

areas. No matter what method is chosen, the important point to remember is that the objectives must be communicated to all.

Once the organization's objectives are determined, an analysis program can be implemented to support the objectives. Two questions that might now arise are--what are the objectives of a management analysis program and how can an analysis program be structured to achieve these objectives? AFM 67-1, Volume II, Part II, states:

> The objective of the analysis program is to improve the efficiency and effectiveness of the supply account by analyzing statistical data relevant to the SBSS and initiating improvement or corrective actions. The section analyzes and interprets management data to determine performance of the supply account effectiveness of supply support, favorable or adverse trends, and computer use. The analysis will include trends, comparison of performance with prescribed standards, recommendations of corrective action for deficient areas, and briefings as required [28:pp.2-30 and 2-72].

Components of An Analysis Program

The objectives are fairly straightforward. The problem arises in the implementation of the objectives. How can an analysis program be structured to achieve the objectives? The analysis program recommended here consists of two parts: a special analysis program and a continuing analysis program.

Special analyses cover the investigation of problems identified by the continuing analysis program, surveillance visits, IG inspections, or simply as a request by the Chief of Supply or the branch chiefs.

The continuing analysis program (which will be discussed later) might identify an area where the account is failing to meet a prescribed objective or goal. As an example, say the accounts goal for overall stockage effectiveness is 90 percent and statistics show the average for the last three months in 85 percent. Management analysis personnel might be requested to perform a special analysis to determine the cause for the decline if no cause is readily apparent.

Special analyses may also be performed as a result of a surveillance visit or IG inspection. Say for example that an inspection reveals that priority issue requests are failing to meet the prescribed delivery time frames. The problem could be in Demand Processing, Storage and Issue, or Pickup and Delivery thus entailing two different branches. Management Analysis personnel could follow the order processing from call-in to delivery thereby determining the bottleneck. They would be able to cut across branch lines and prevent possible "finger-pointing" between the two branches involved.

A final area in which special analyses could be used is at the request of the Chief of Supply or the branch chiefs. Requests for special analyses should not be used by the branches to abdicate some of their management responsibility. Only if it is beyond the capability of the individual branches to solve the problem should management

analysis personnel then be utilized. There are two reasons for this restriction. First, most management analysis sections are not heavily manned. The section has been recently established and in many ways the functions and responsibilities are still being defined. An excessive number of special analyses could overload the section and reduce the quality of analysis. Second, the branches themselves have the management responsibility to solve their problems when possible. An over reliance on management analysis could result in the branches simply passing along problems they do not care to deal with to someone else. Therefore, requests for special analyses should be used sparingly and fully justified.

Special analyses performed should be fully documented. The method of documentation can take many forms. AFP 178-2, Wing/Base Level Management Analysis, gives the Air Force Staff Study format as the recommended written format for an analysis. The format is listed in Table 4-1. Table 4-2 contains some techniques and recommendations for the content of the study.

The presentation of special studies may be oral or written. Written presentation might entail simply sending the documented report to the requestor of the study. Oral presentation might entail a formal briefing. The deciding criteria as to whether to use oral or written presentations should be based on the results of the study itself. As an

TABLE 4-1

Air Force Staff Study Format (33:79)

SUBJECT:

PROBLEM:

1.

FACTORS BEARING ON THE PROBLEM:

2. Facts

a.

b.

3. Assumptions

4. Criteria

5. Definitions

DISCUSSION:

6.

7.

8.

CONCLUSION:

9.

ACTION RECOMMENDED:

10.

11.

TABLE 4-2

AFP 178-2 (33:77)

SUBJECT:	(Only long enough for identification.)
OBJECTIVE:	(A clear statement of what you are solving.)
SCOPE:	(Describes the area which the study covers. Should contain an accurate description of what is contained in the study, the time period covered, extent of subject matter treatment.)
LIMITATIONS:	(Difficulties encountered; facts which tend to limit the validity or coverage of the subject - clearly point out all limitations.)
DISCUSSION:	(Never proceed upon the assumption that certain aspects of the subject are generally understood and need no explanation--each detail which is necessary to the logical development of your recommendations must be included. If your discussion does not support your ultimate findings, the desired interest and action of command will not be forthcoming.)
FINDINGS:	(Must be completely borne out by the narrative discussion and must not include matter which is more properly classified as the opinion of the writer.)
RECOMMENDATIONS OR ALTERNATIVES:	(This section is controversial. Some argue that to preclude bias, the decision maker should only be presented with findings and conclusions and arrive at a decision by himself. Others maintain that alternative solutions be presented, but the analyst should not grade these alternatives. However, if recommendations are based upon a logical development of supporting data--if they represent sound principles of management properly applied, if they are based on complete coordination with responsible operating officials, if they are supported by practical precedent and are

TABLE 4-2 (continued)

properly applied to the particular situation at hand--then, and only then, you may be certain that you have fulfilled the duty required of you as an analyst.)

example, if only one branch in the squadron is involved then a written report might be sufficient. If several branches are impacted by the study, a briefing with all interested parties might be the best method.

A management analysis program is much more than just periodic special analysis. It is a continual process of evaluation of the performance of the supply account. This is the continuing analysis part of the recommended analysis program. In many supply accounts, this consists of the monthly "How Goes It" briefing in which charts of management indicators are shown to branch and section level personnel. The format and content of this program will vary depending on the local requirements. The program might entail daily, weekly, or monthly review depending on the importance of the area under review.

The daily review might consist of a sheet of indicators with data from the prior day that it is sent to the Chief of Supply and the branch chiefs. The sheet could show the cumulative stockage effectiveness for the month, the number of items NMCS and PMCS by weapon system supported, the number of computer rejects by branch, the number of delinquent documents by branch, etc. Items chosen for daily analysis should be areas of high concern to management and care should be taken not to overreact to potential random daily fluctuations in some of the management data presented.

Weekly reviews could follow the same pattern as daily reviews with a published indicator sheet, or it might entail weekly computer running of the Base Level Supply Management Report, M32, and/or briefings at weekly staff meetings. The decision of which method to use should be based on local requirements.

Many supply accounts conduct a monthly analysis program called the "How Goes It." The M32 report and other important management reports are required on a monthly basis and form the nucleus for the monthly analysis program. All four of the major commands in our study required the submittal of certain management data by their bases. This is an excellent starting point for the monthly analysis program. Other management indicators might also be used to supplement these required indicators. (Selection and use of management indicators will be discussed later.) The monthly review would entail all aspects of the supply operation.

Major Merle P. Martin proposes a program of selective analyses based on a hierarchy of indicators. He states that many performance indicators are interrelated. As an example, overall stockage effectiveness is composed of various components broken out on the M32. These are EOQ, repair cycle, and equipment stockage effectiveness. It is also broken out by AFM 66-1 maintenance, civil engineer, vehicle maintenance, and other organizations. Stockage effectiveness for General Support Division and System Support Division of the Air

Force Stock Fund are also given. The point is that all the component indicators need not be reviewed at the same time. Overall stockage effectiveness may be reviewed on a weekly basis and the component parts reviewed monthly or quarterly. Major Martin proposes an analysis program which reviews only a select number of indicators on a weekly and monthly basis and a full range of indicators on a quarterly basis (11:101).

The decision as to the time frame of the analysis program must be made by each specific supply account based on their objectives and needs. A monthly analysis program is recommended in this study because the primary management data source, the M32 report, is updated monthly and the four major commands in the study required monthly data.

The analysis program recommended here consists of two parts: a special analysis program and a continuing analysis program. Whatever type of program is established, it must support the objectives of the organization. Figure 4-1 represents the program flow of a management analysis program.

Use of Management Indicators

The objectives of a management analysis program, as discussed previously, were to ensure the efficient operation of the base supply account through a program of review and analysis of management data that enables the account to meet its organizational objectives. The program of review and analysis is accomplished through the use of management

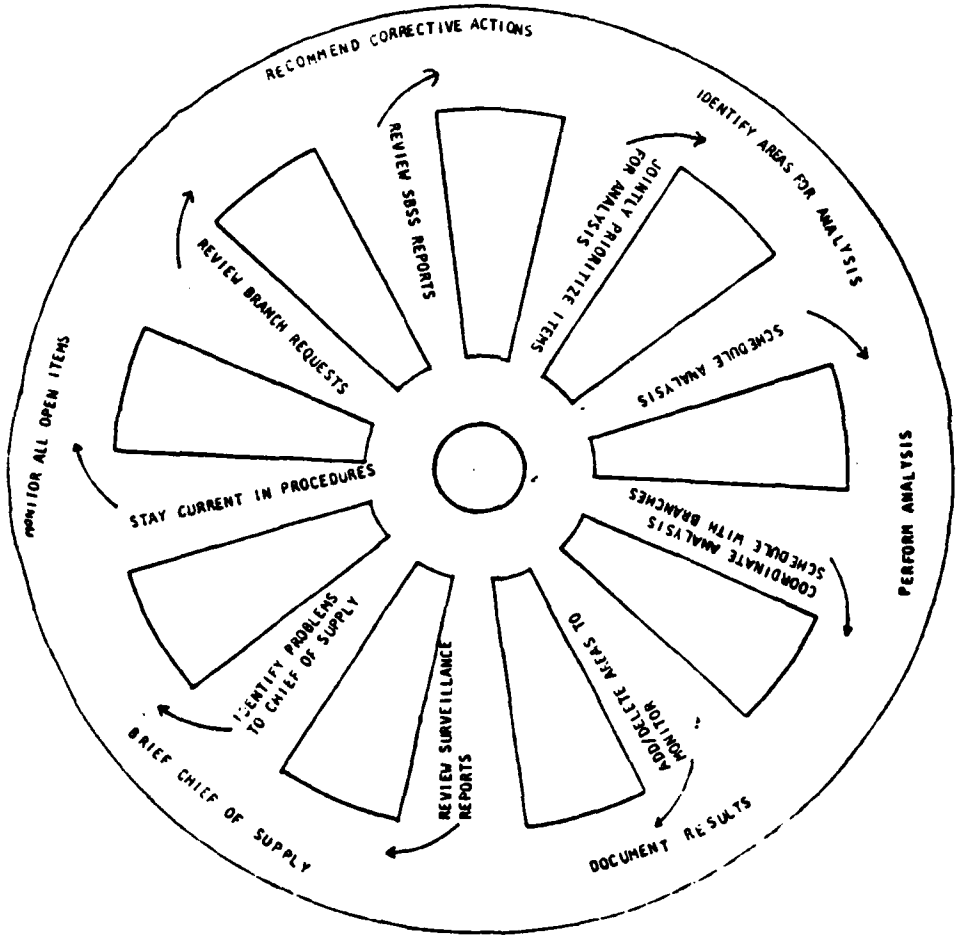


Fig. 4-1. Management Analysis Program Flow

indicators. Management indicators are the foundation for the continuing analysis program. The management indicators chosen for this study represent a comprehensive cross section of the entire supply operation and will accurately portray the operational condition of the supply account. Other indicators might be added at individual bases to portray specific problem areas.

How are management indicators used? They are used to measure the performance of the supply account to the objectives that have been established. The organization objectives are displayed on the management indicator through the use of standards or control limits. Standards established for management indicators should be carefully developed. They should be realistic and reliable. The standards should be challenging but external resource limitations should be considered. They should be flexible to enable them to adjust to changing conditions. Provisions should be made to periodically review the standards to ensure they are still applicable.

A hypothetical example can be used to explain the above criteria. At base X, EOQ stockage effectiveness is a management indicator used in the base supply account continuing analysis program. EOQ stockage effectiveness is a broad measure of the performance of the account. The Chief of Supply, after consulting with the squadron's management personnel, has set the squadron's standard for overall stockage

effectiveness at 88 percent. This standard presents a challenge but yet is realistic and attainable. Theoretically, if no external management action is taken and the supply system operates as designed, the EOQ stockage effectiveness should be 84.13 percent. The challenge is presented to management to develop means to achieve the 88 percent stockage effectiveness. Eighty-eight percent is probably not an unrealistic figure to most supply accounts if resources are available. Excessive workload or manpower limitations may preclude any external management action. To explain flexibility of the standards, assume that the major command of base X has just cut each bases' General Support Division Stock Fund Operating Program by 10 percent. It would be highly questionable if base X would be able to attain or maintain an 88 percent EOQ stockage effectiveness. It would be necessary to reduce the standard to a more realistic figure.

Establishing good standards is extremely crucial to the analysis program. Standards that are "too easy" may breed complacency and a lackadaisical attitude, while standards that are unattainable may result in frustration of the people and they may simply give up trying to achieve the standard. Standards should be established in the same manner as discussed earlier in the establishment of the organization's objectives as the standards used should relate directly to these objectives. No matter how difficult determination of standards are do not forgo their development

and use. Without standards or objectives, the organization is like a ship without a rudder sailing along without any purposeful direction.

After management indicators have been chosen and standards established, a frequent question is how should the indicators be presented. AFP 178-2, Wing/Base Level Management Analysis, presents 36 pages of information on graphic presentation. They present four principles to be followed:

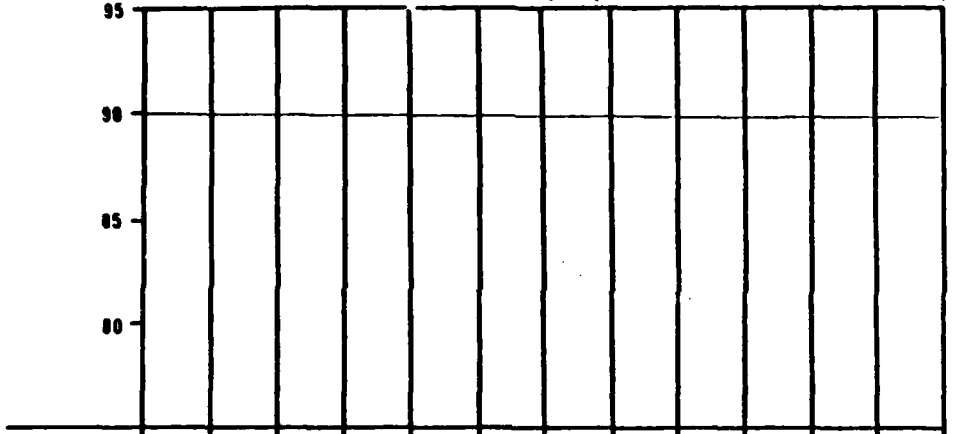
> . . . be direct, be clean, be simple, be accurate . . . Specifically being direct means focusing sharply on the main idea. Being simple means organizing functionally and avoiding needless detail. Being clear means translating unfair terms and concepts. Being accurate means providing a correct interpretation and impression of the facts [33:148].

We will not go into detail here on the techniques presented in AFP 178-2. We do believe this pamphlet should be readily available and used by supply management analysis personnel.

The method of presentation which is recommended in this paper is a two-scale chart measuring data (raw data or percentage) on the vertical axis and time (in months) on the horizontal axis. Figure 4-2, a chart on overall stockage effectiveness from the 375 Supply Squadron, Scott AFB, Illinois, is an example of this type of commonly used chart. It displays the percentage stockage effectiveness on the vertical axis and the month on the horizontal axis. On this chart the standard has been established at 90 percent overall stockage effectiveness.

375 SUPPLY SQUADRON
OVERALL STOCKAGE EFFECTIVENESS

FORMULA: REQUEST ÷ TOTAL ISSUES + B/O (EXCEPT NON-STOCK ITEMS)



MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
%												
MAC %												
STANDING												

SOURCE: M32 OPR: LGSM

Fig. 4-2. Management Indicator Chart Example

Numerous statistical methods might also be used to display relevant information on the charts. The standard might be displayed as control limits instead of a single figure standard. In this example, the upper control limit might be set at 93 percent and the lower control limit at 85 percent. Management action would only be required if stockage effectiveness fell outside these control limits. Regression analysis (fitting trend lines) might also be used. These trend lines would show the direction of movement of the indicator and could also be used for predicting future results. Again, we will not go into detail here on statistical techniques. Numerous texts are available for this and AFP 178-2 contains 87 pages on statistical and mathematical techniques. The important point to remember in using these techniques is to avoid techniques that are not readily understood by the personnel who will be using the management indicators. These techniques will only have meaning if they are understood by the users of the information.

The method of presentation of management indicators must be determined locally by each supply organization to meet its needs and will be constrained by the resources available. The two-scale chart method recommended here is a simple yet very informative method. Standards must be displayed on the charts to provide a sense of direction for the organization. We also recommend the use of trend data

to preclude over-reaction to random monthly fluctuations in the data. Regardless of which management indicators are used and how they are displayed, they must be understood by the management personnel who will be using them.

Common Management Indicators

Determining the commonality of indicators was a difficult task. Of the four major commands surveyed, the format of indicators varied significantly. Various publications from the major command were researched and compared with only a very few management indicators being common. A common indicator is defined as those indicators that reflect a broad spectrum of the base level supply operations. Information received from the major commands showed, for example, that one command used days/time to measure Average Repair Cycle and another command used Units to measure this indicator.

Basically, the four major commands were using the same version of all the indicators but they used different measuring units. Indicators were selected using the data collected from the four major commands and the M32 Monthly Base Supply Management Report. The M32 was the primary source used to determine the common management indicators because it is an Air Force wide standard supply report. The indicators selected to be analyzed represent a broad spectrum of the entire supply operations.

The common indicators selected were grouped into six support categories. The definition of each indicator is provided in the analysis of the indicator in answering research question five. The categories with the selected indicators are:

1. Stockage Support Indicators
    a. Stockage Effectiveness
    b. Item records with requisitioning objectives and zero assets
    c. Bench stock due-out rates
    d. Excess inventory
2. Not Mission Capable Supply (NMCS) Indicators
    a. NMCS rates
    b. Mission capable cause code analysis
    c. Mission capable deletion code analysis
3. Priority Support Indicators
    a. Priority due-outs
    b. Priority requisition rate
    c. Urgency of Need (UND) A and B due-out cancellations
4. Warehouse Storage Indicators
    a. Serviceable balance with no warehouse location
    b. Warehouse refusals
    c. Overall inventory accuracy
    d. Item records past due inventory

5. Repair Cycle Asset Support Indicators

6. Computer Utilization Indicator

The common indicators listed are by no means a complete list of all the indicators applicable to a supply operation. Supply organizations should choose indicators that are representative of their particular operations. Management indicators from the four major commands surveyed are listed in Appendix C. These indicators are presented for two reasons. First, the tremendous number of different management indicators used illustrates the difficulty involved with selecting a common indicator. Second, a list of management indicators presently being used may serve as a reference guide for supply personnel.

CHAPTER V

ANALYSIS OF SUPPLY MANAGEMENT INDICATORS

Overview

This chapter will present a detailed analysis of the 16 management indicators chosen for this study. The indicators have been separated into six support categories:

1. Stockage support indicators
2. Not mission capable supply indicators
3. Priority support indicators
4. Warehouse storage indicators
5. Repair cycle asset support indicators
6. Computer utilization indicator

Specific indicators are analyzed in each support category. The analysis begins with a description of the indicator and its importance to the supply system and then follows with a discussion of potential causes of unfavorable trends and recommended management actions for each indicator. Fiscal year 1980 data for each indicator accumulated from the Military Airlift Command, Strategic Air Command, Tactical Air Command, and Air Training Command is presented in Appendix B. The data presents the overall average for the commands on a monthly basis and may be used by local supply managers as an aid in establishing local standards for each management indicator. The data was obtained from the

USAF/MAJCOM Management Report (316-43) obtained from the Air Force Data Systems Design Center.

Stockage Support Indicators

Stockage Effectiveness

Stockage effectiveness is the basic measure of supply support to the customer. The indicator measures the percentage of customer requests issued from stock for items required to be stocked by the supply system. It differs from issue effectiveness in that issue effectiveness measures how often the supply system has a requested item whether the item is stocked or not. Stockage effectiveness is the better measure since it is unrealistic to expect the supply system to be able to anticipate first time demands.

Stockage effectiveness data is measured by the following formula:

$$\text{Stockage Effectiveness} = \frac{\text{line items issued}}{\text{line items issued plus (line items backordered minus line items backorderd 4W)}}$$

Line items issued are accumulated for all transactions with specific type transaction phrase codes (TTPC). The specific TTPC are listed in AFM 67-1, Volume II, Part 2, Chapter 24, and will not be repeated here. It is sufficient to say that the item was issued to the customer. It should be noted that it is measuring line items and not units. Line items

backordered is self-explanatory. These totals are accumulated for all transactions with TTPC 2D. This is the creation of a due-out. TTPC 4W due-outs are excluded as these due-outs are for items that are not authorized stock by the supply system because of insufficient demands placed on the system by the user.

Stockage effectiveness data is portrayed on the Customer Support Effectiveness page of the monthly M32. First data is separated by type organization into maintenance, civil engineer, vehicle and other organizations. Totals are then accumulated into an overall summary. Each organization page is further separated by urgency of need, stock fund division, and Expendability/Recoverability/Reparability/Cost (ERRC) Designators of recoverable, economic order quantity (EOQ), or equipment items. The authors' recommendations as to which indicators to review as part of your monthly "How Goes It" are maintenance organization, overall EOQ, overall repair cycle, and the overall total stockage effectiveness. Maintenance organization data measures supply support of the base flying mission which is the primary mission of most base supply accounts. EOQ items account for the largest number of line items in most supply accounts and therefore have a significant impact on supply stockage effectiveness. As of 30 September 1980, 82 percent of all item records with a requisitioning objective (RO) in the Air Force were EOQ items (27:15). Repair cycle items

are important because of the high dollar value of these items. Even though small in number, as of 30 September 1980, 87 percent of the dollar value of all item records with a RO were repair cycle items (27:15). Overall stockage effectiveness would measure the supply support given to all supply customers.

To understand the stockage effectiveness management indicator, it is essential that personnel understand how the supply system determines demand levels. The supply system is a demand driven system. HQ USAF determines base level inventory policy by establishing when an item will be stocked and how much of the item to stock. When an item will be stocked is determined by the number of customer requests (demands) for the item and the urgency of the customer's need. Stockage priority codes are assigned for EOQ items based on the urgency of need designator (UND) assigned by the customer when requesting the item. The number of customer requests needed to establish a demand level varies by the type and number of requests. Only recurring customer requests will be used to determine establishment of a demand level. For repair cycle items, two demands per year are required before items are eligible for demand levels. For EOQ items, the number of demands needed is dependent on the stockage priority code but at least three recurring demands per year must be recorded prior to establishing a demand level. Determinat n of the actual demand level is

accomplished through rather detailed formulas. For repair cycle items, the level is based on the daily demand rate, how often the item can be repaired on base (percent of base repair), how long it takes to repair the item (repair cycle time), the expected order and shipping time, and a safety level quantity. An adjustment is also made depending on the cost of the item. EOQ items demand levels are determined by the use of an economic order quantity model which balances the cost to order with the cost of holding inventory in stock. This basic model includes the daily demand rate, the stockage priority code assigned, the unit price of the item, holding costs, and ordering costs. The EOQ level is then adjusted by the time required to order and ship an EOQ item and a safety level quantity. The safety level quantities used by the Air Force are designed to give the supply system an overall stockage effectiveness of 84.13 percent. Appendix B shows the monthly stockage effectiveness for MAC, SAC, TAC, and ATC combined for FY 1980.

Stockage effectiveness measures how often the supply system has the items for which stockage is required. Based on the above discussion, the UNIVAC 1050-II computer system should provide a stockage effectiveness of 84 percent. In many cases, this figure is not achieved (see Appendix B). What can cause a low stockage effectiveness? Since stockage effectiveness is a general indicator of the overall supply operation, many factors affect the indicator. This paper

will discuss these factors under two categories: base factors and off-base factors.

Base factors affecting stockage effectiveness can be divided into supply squadron actions and customer actions. One of the first areas to investigate internally within the supply squadron would be the requirements computation and file status programs. The requirements computation program compares the total assets available (assets on hand plus on order) with the total assets required (total of the requisitioning objective plus due-out requirements). If the total assets available are equal to or less than the computed reorder level plus due-outs, a stock replenishment requisition is created. (The reorder level for EOQ items is the order and ship time quantity plus the safety level quantity. For repair cycle items, it is one less than the demand level.) The importance of requirements computation is readily seen. Without it, stock replenishment actions will not take place automatically. Whenever there is an adjustment in the asset position or demand data of the item, the computer will store an R in the requirements computation indicator field. The requirements computation program will then read the R stored on the item record and review the item for possible requisitioning action. The requirements computation program is run continuously when the computer is "in-line" except when input/output are being created on the card reader or a remote. Requirements computation is automatic when the change in

asset position is created by a UND A customer request. UND B and C requests requirements computations are completed during releveling. Releveling should be accomplished daily. If it is not accomplished daily, a delay occurs in the requisitioning. This delay is not accounted for in the computations of demand levels. The order and ship time accounts only for demand from the time of creation of the due-in until receipt of the requisition. The due-in will not be created until requirements computation has been completed. This delay increases the likelihood of a stock-out and therefore can decrease your stockage effectiveness.

The M32 gives the number of times releveling is completed but this may be misleading. The Automated Data Processing Equipment (ADPE) unit may be releveling several times on some days and none on other days. Therefore, it is important for the manager to ensure releveling is accomplished completely each day to avoid adverse impacts on stockage effectiveness.

File status is another important internal factor which might adversely impact on stockage effectiveness. File status is a complete computer review of the entire item record. The file status program will update demand levels, identify excess, and delete inactive items. The program is important to stockage effectiveness since it is the only automatic update of demand levels. If demand for an item is increasing, file status will increase the demand level

to meet the increased need. In this case, if file status is not completed, the demand level will not be sufficient to meet customer requests and stockage effectiveness will decrease. Therefore, it is important that file status be completed each quarter. File status quarter codes are recorded on the item record and reflect when file status was last completed. The M32 under Item Record Data also gives the number of items with a current file status quarter code which would indicate whether completion of file status is ahead or behind schedule.

Another supply squadron action would be the minimization and effective control of Requisition Exception Codes (REX). REX codes either prevent or delay requisitioning of assets. Again the supply system does not account for this delay in computing demand levels. Therefore, stockage effectiveness can be adversely impacted by uncontrolled use of REX codes. The M32 shows the number of REX codes assigned. The R32, Selective Item Record Readout, program can be run to get a listing of items records containing REX codes, and can be used to review and reduce the number of REX codes assigned.

Base supply customer actions can also impact stockage effectiveness. Since the demand level is driven by customer requests, it is important that customers effectively plan and submit requests to supply. Supply customers should try to space out their requests and avoid ordering large

amounts once or twice a year on a high priority request. Periodic ordering is essential to establishing an accurate daily demand rate. These requests must be ordered as a recurring demand before the supply computer will record a demand applicable to creating a demand level. An effective supply customer training program is essential to inform supply customers of the need to space their requests and order them as a recurring demand.

The customer can impact significantly on repair cycle asset stockage effectiveness. Demands are recorded for repair cycle items when the reparable item is turned in or by the processing of a TRN. The TRN is a maintenance turn-around of an item. In this instance, maintenance has removed a defective item, repaired it, and replaced the item without placing a demand on base supply. Maintenance should provide the Repair Cycle Support Unit of base supply data necessary to process a TRN which will record a demand on the item record and update the repair cycle time on the repair cycle record. Failure to process the TRN will result in reduced and insufficient demand levels and reduced repair cycle asset stockage effectiveness. Another customer impact on repair cycle asset stockage effectiveness is the repair cycle time. The Repair Cycle Time (RCT) is the computed time for repair of assets on base. This figure is input into the repair cycle quantity which makes up part of the repair cycle demand level. The average RCT is used in the computation of the demand

level for repair cycle items up to a maximum of six days for ERRC codes XD1 and XD3 and nine days for ERRC XD2 and XF3. If repair cycle time is exceeding the six and nine days maximum, then demand levels will not be sufficient to meet needs and stockage effectiveness will be adversely impacted. Aggressive action should be taken to find the cause for the excessive RCT. The Repair Cycle Data List, QO4, computer printout will show all repair cycle records for which the computed average repair cycle days exceeds the maximum days. Exception repair cycle time can be added to the repair cycle record on an individual item record basis when approved by the senior materiel officer at wing level. Exception days for groups or classes of items must be approved by HQ USAF. Do not overlook this area as it can have a significant impact on your stockage effectiveness. Appendix B shows that repair cycle stockage effectiveness is consistently lower than EOQ. Even though the volume of requests for repair cycle items is low, these items are usually direct mission support items and therefore critical.

There are factors outside the base level that can also impact on stockage effectiveness. These factors fall under depot/source of supply support. If the depot is not providing adequate support to the base, stockage effectiveness can be severely impacted. Air Force base level supply accounts get their primary support from four sources: Air Force Logistics Command (AFLC), General Services

Administration (GSA), Defense Logistics Agency (DLA), and local purchase (LP). When base supply requisitions an item, the primary concern is on how long does it take the depot to get the item to the base. This time impacts on the demand level of the item through the order and ship time. The order and ship time is the average time from initiation of a requisition to receipt of the requisition. This order and ship time is computed for each routing identifier (source of supply base, such as Ogden ALC). The time is then multiplied by the daily demand rate to get the order and ship time quantity component of the demand level.

There are two pages of the M32 which would indicate potential problems in this area. First, the due-out analysis page of the M32 gives a breakdown of due-out cause codes. These codes explain the base stockage position at the time of the customer request. Cause codes H and J relate to depot support. Cause code J indicates the requested item is authorized to be stocked by the supply system, a stock replenishment requisition has been submitted, and the requisition does not exceed standard time frames. Cause code H indicates the item is authorized stockage, a requisition exists. but the source of supply has exceeded the standard time frames. Standard time frames refer to the length of time a source of supply has to provide the base with the requested item. As an example, for a priority group one requisition (priorities Ø1 to Ø3) the source of supply should provide the base with

the requested item within eight days if the item is stocked at the depot. Cause code H due-outs indicate the source of supply is not meeting these required time frames. Failure to meet these time frames can adversely impact stockage effectiveness. Cause codes will be discussed in more detail when not mission capable supply indicators are analyzed.

The M32 will specify on the source of supply summary page how well specific sources of supply are meeting the required requisitioning time frames. The page summarizes by AFLC, DLA, GSA, LP, and other sources of supply. How many requisitions were received within the standard time frames are given as well as the average order and ship time and how many requisitions exceed 175 percent of standard time frames. The figures for the number of requisitions exceeding 175 percent of standard time are especially significant. When the computer figures order and ship times, it excludes from the computations all requisitions which exceed 175 percent of the standard time. Yet these are the requisitions which are taking the longest time to receive at the base. A large number of requisitions exceeding 175 percent of standard time could result in lower than needed order and ship times and indicate a depot support problem.

What can be done to solve the problem? It is important that the depot causing the problem be isolated so that corrective action can be taken. The Routing Identifier Listing, QØ5, will give a breakout by routing identifier of

the number of days required by the depot to fill requisitions. Running the QØ5 program will also update the order and ship time for each depot. This report can help isolate which source of supply might be slow in filling requisitions. Once the source of supply has been identified, the squadron can take action through its major command to determine the reason for the excessive order and ship times. The major command also has the authority to approve the use of exception order and ship times for specific line items. As an example, if depot X has a seven-day order and ship time, yet the base knows from running transaction histories on certain items that it is taking 15 days to receive the item, the base can request authority to load a 15-day order and ship time. The override capability should not be used to compensate for temporary out of stock conditions, but only used when the source of supply has confirmed an extended lead time for procurement of the item.

The preceding paragraphs have discussed potential problem areas and corrective actions. Methods are also available to serve as preventive measures. If manpower is available in stock control, a manual review and requisitioning program can be used to maintain a high level of stockage effectiveness. The program utilizes application codes to identify items relative to specific systems, subsystems, end items, etc. Use of the application codes allows stock control personnel to selectively review the stock position of

designated items. The R32 program will select item records by application code for review. Use of an example will explain the procedure. An application code was loaded to all item records supporting the J60P3A engine. An individual in the Requisitioning Unit of Stock Control was given the responsibility for review of the engine items. The review was spaced over a one month time frame and the individual would run an R32 selecting on the J60-P3A application code. The listing would give present demand information, due-ins, due-outs, source of supply, etc. The requisitioning clerk would use the listing to review the item demand level and the asset position. In reviewing the asset position, the number of assets on hand and on order were compared to the demand level and the reorder point. A decision was then made based on the asset position, the status of any due-ins, and the usage rate of the item as to whether to submit a requisition to the source of supply prior to reaching the reorder point. The intent was to keep items in the pipeline flowing to the base. Judgement must be used in reordering to avoid an excessive number of small orders. A local decision criteria can be established that allows the requisitioning clerk to make the decision or to require review by the requisitioning supervisor or stock control officer.

Another use of the listing was to review the demand level and compare it to the number of demands for the item. If it appeared the computed demand level was not enough to

support the demand, then FCL inputs can be created to increase the demand level. Extreme caution should be used in doing this to prevent the potential buildup of excess assets and to prevent unnecessarily tieing up assets that might be needed at other bases. Decisions on this should be made by supervisory personnel.

This discussion on stockage effectiveness has been lengthy but necessary. Stockage effectiveness is the overall measure of supply support to the base. It is essential that supply officers understand how stockage effectiveness is determined, what can adversely impact on the indicator, and some methods for improving stockage effectiveness. The methods discussed above are going to be dependent on the manpower available, but preventive measures to maintain a high stockage effectiveness may in the long run take less manpower than corrective measures.

Item Records With a Requisitioning Objective and Zero Assets

The requisitioning objective (RO) is the basic stockage objective for an item in the supply system. It is the maximum quantity of an item that should be on hand or on order for stock replenishment at any given time to support and sustain the base mission. The requisitioning objective is composed of the demand level, any special level quantity, and the war reserve materiel quantity. Thus, the requisitioning objective is determined by customer usage as computed

by the demand level, factors where usage is not the best predictor of future needs, or special war time needs.

It is important the supply manager have an understanding of how well he is supporting items that have been determined to be needed to support base operations. Stockage effectiveness is one indicator which gives the manager information on support over a monthly time frame. The number of item records with a requisitioning objective and zero assets on hand provides an indicator of asset position at a specific point in time. Page 15 of the monthly M32 contains the needed data and the formula is:

$$\frac{\text{Number of item records with a RO and zero assets}}{\text{Number of item records with a RO}}$$

The manager should try to minimize the number of item records with a RO and zero assets with the understanding that base level stockage policies for items with a computed demand level will provide for only an 84 percent stockage effectiveness. Therefore, it is unrealistic to expect to eliminate items with a RO and zero assets available.

Several factors could result in a high percentage of item records with a RO and zero assets on hand. Poor depot support can impact in this area and can be evaluated by analysis of due-out cause codes and receipt of requisitions within standard time frames. Analysis of these two areas is covered in more detail in other sections (see stockage effectiveness and MICAP/due-out cause codes). The important

point is to try to isolate the item, the source of supply, and the specific reason why the source of supply is not providing the assets. Evaluation of all items impacted by depot support problems is not feasible; therefore, selective analysis based upon the critical nature of the item is important. As an example, bench stock items would be analyzed before base service store items. Use of the R32 program to select specific application codes for review by stock control is an excellent way to identify importance of the item.

The Air Force Stock Fund General Support Division Operating Program can have a significant impact on this indicator. The Air Force Stock Fund is a "resolving fund or working capital fund which finances inventories and generates income by selling such materiel to the requiring activity/ customer [22:p.6-10]." The General Support Division (GSD) consists of items assigned ERRC "XB," "XF," or "NF" (unit cost less than $3,000) and assigned budget code 9 (22:p.6-9). These are predominantly EOQ items and since, as of 30 September 1980, 82 percent of all item records with a requisitioning objective were EOQ items, it is apparent this program can have a significant impact.

The GSD program is based on the concept that $1.00 of stock replenishment orders may be requisitioned for each $1.00 of GSD sales. The program has specific sales, orders, and inventory objectives for each fiscal year. Generally,

a plus or minus 5 percent variance in inventory levels is accepted. Also, the plus or minus 5 percent variance is applied to the sales and orders programs (or $.95 to $1.05 in orders for every $1.00 in sales).

Whenever significant shortfalls in sales or excessive inventory levels occur, external controls are used which will restrict the requisitioning of stock and increase the number of item records with an RO and zero assets. Limitations are placed on the system using the materiel acquisition control record (MACR). The MACR is called the "key to inventory management, since it can adjust or preclude automatic requisitioning of materiel [28:p.26-21]." The MACR provides for control by stockage priority code (SPC) and stockage priority code subgroup where the subgroups are divided into bench stock items, individual equipment items, base service store items, and all other budget code 9 items. The MACR places limitations on the EOQ portion of the requisitioning objectives (the other parts being order and ship time stock and safety level stock). Normally, when an item reaches its reorder point, the entire EOQ quantity is ordered bringing the item up to the requisitioning objective. A 60 percent MACR factor would restrict the ordering of 40 percent of the EOQ quantity. As an example, assume an RO of 100, a reorder point of 20, and a MACR of 60 percent. When the reorder point is reached, only 60 percent of 80 units or 48 units would be requisitioned as opposed to 80 units requisitioned

when no controls are used. The limitations increase the chance of running out of stock for controlled items thereby increasing the number of item records with a RO and zero assets.

The key to effective use of the MACR factor when it is required is the application of selective control by SPC subgroup and fund requirement cards. Most bases would generally restrict the other category and base service store items (primarily administrative and office supplies) before they would individual equipment and bench stock items as these provide more direct support to the primary flying mission. Another selective method of control when using MACR controls is the use of fund requirement cards (FRC). When MACR controls are established, the program can be requested to also provide FRC cards. When FRC cards are requested, there is no automatic requisitioning at all. Using the previous example, when the reorder point is reached, a FRC card is output with a requisitioning quantity of 48 units. This FRC card must be manually reviewed and reinput into the computer before a requisition will occur. In this case, not only is the item requisition quantity controlled, but each individual item can be selectively reviewed prior to requisitioning. FRC cards provide an important management tool but can create a tremendous workload for stock control personnel. Another factor to remember is that production of FRC cards delays requisitioning due to the administrative manual review

required and this delay is not considered when order and ship time computations are made.

The MACR Factor Analysis Program, R45, provides the manager with the management information to evaluate the dollar impact of MACR factors. The program lists the dollar value of the EOQ segment of the requisitioning objective by SPC and SPC subgroup. It also gives the dollar value of MACR restrictions on the EOQ segment of the RO (MACR RO - NO BUY) and the dollar value of the EOQ segment of the RO that will be requisitioned (MACR RO - BUY).

When using MACR factors, the manager must remember that

> . . . the MACR adjusts the requisitioning quantity at the time that a requirement to requisition is generated, instantaneous results from the application of these factors cannot be anticipated [28:p.26-25].

Generally, it will take a minimum of 90 days before the impact of MACR factors on the number of item records with an RO and zero assets will be fully realized.

Computer programs can be developed to read out by line item those items with a RO and zero assets. In doing this, management can review each item and research the reason for the zero balance condition. When restrictions are placed on stockage of items, this program review can become cumbersome. At that time, a review of critical items selected by application code might prove more cost effective.

Bench Stock Due-Out Rates

If there is a specific category of items that contribute most to the primary mission of a base, it is bench stock. Lieutenant Colonel Wayne Kirk stated "a maintenance weapon system bench stock is the 'life blood' of the base level repair cycle [10:1-9]." Many bench stock items are used directly on the weapons system as well as repair parts for sub-systems. AFM 67-1, Volume II, Part One, states "the importance of an adequate effective bench stock operation cannot be overemphasized [25:p.18-1]." It is extremely important the supply manager knows the effectiveness of the bench stock operation. The measure of bench stock effectiveness portrayed on the M32 report is the bench stock due-out rate and delayed due-out rate. Bench stock due-out rate indicates the percentage of total authorized bench stock line items that are due-out. The formula is:

$$\frac{\text{Total line items due-out}}{\text{Total line items authorized}}$$

The delayed due-out rate indicates the percentage of total authorized bench stock line items that have been due-out 15 days or more. The formula is:

$$\frac{\text{Total line items due-out 15 or more days}}{\text{Total line items authorized}}$$

The bench stock due-out rate is not measured in the same manner as stockage effectiveness. Stockage effectiveness

represents data accumulated for the entire month whereas the bench stock due-out rate measures the number of due-outs as of the date of the computer running of the M32 report. As an example, if on the date the M32 report is produced 100 line items were authorized and twenty were due-out, the due-out rate would be 20 percent. All customer requirements for the entire month may have been met while the twenty due-outs were created on the last day. Therefore, the due-out rate is not indicative of bench stock operations throughout the entire month but only on the last day of the month.

Many factors can effect the bench stock due-out rate. Some of the factors discussed under stockage effectiveness impact on bench stock such as maintenance of adequate stock levels for items with a demand level, control of requisition exception codes, proper releveling and file status, and poor support from the source of supply. Remember that bench stock due-outs are normally routine due-outs which means they would be a priority group three requisition. The UMMIPS standard for source of supply response time for priority group three requisitions is 31 days (within the continental U.S.). Therefore, if all sources of supply were meeting the standard, it would take approximately 31 days to get most bench stock due-outs for the customer. The corrective actions for the above problems would be the same as actions discussed under stockage effectiveness. Limitations on the General Support Division of the Air Force Stock Fund, through use of MACR

factors, can also impact on bench stock due-out rates. Use of MACR factors will reduce the amount of inventory on hand and thereby increase the chance for a due-out. Usually, bench stock is the last category of items restricted by use of MACR factors due to the critical nature of most bench stock items. If MACR factors are to be used on bench stock items, it is important the impact of MACR factor control be evaluated.

The date of the creation of the bench stock due-out can impact on the due-out rate. This was alluded to earlier when it was noted that the due-out rate is measured at a point in time instead of accumulated throughout the month. Bench stock personnel are required to conduct a monthly inventory of all bench stock locations. When the quantity on hand in the bench stock is equal to or less than 50 percent of the authorized bench stock level, the bench stock will be filled with the authorized quantity from stocks in the supply warehouse. If bench stock inventories are conducted near the end of the month and due-outs are created, the supply system will probably not have time to react and obtain the items that are due-out prior to the end of the month computer runs. Therefore, these items will contribute to the bench stock due-out rate. If inventories are conducted early in the month, the system may be able to react and eliminate the due-outs prior to the end of the month. The intent of the corrective action should not be to make the

indicator look "good," but management should know whether or not late month inventories are making the indicator look "bad." A factor effecting when inventories are conducted is the workload of the bench stock unit. It may be necessary to spread out inventories over the entire month due to the large number of bench stocks.

Use of minimum reserve authorizations (MRA) can also impact on the bench stock due-out rate. Generally, bench stock item levels are based on past customer usage or consumption criteria. There are exceptions when bench stocks may be established where the item does not meet the normal usage requirements of the bench stock program. These exceptions are in AFM 67-1, Volume II, Part Two, Chapter 17, and will not be repeated here. When these exceptions are authorized, a MRA level is established as the bench stock level. What can happen is that the MRA level is larger than the demand level/requisitioning objective. In this instance, every time the bench stock is filled a due-out will result. The reason is that the MRA level does not change the demand level computed for the item. As an example, assume a demand level of two for an item and a bench stock MRA level of five. When the bench stock is filled, five units are needed while only two will be stocked in base supply. A due-out will always result. To alleviate the problem, MRA levels should be reviewed and MRA levels exceeding the demand levels kept to a minimum. One potential reason for excessive use of MRAs

might be their use in lieu of special levels. Some supply personnel have established bench stock MRAs for items as opposed to going through the procedures for establishing special levels so as to keep down the number of special levels. This is an improper use of the MRA concept.

If the bench stock due-out rate indicates a problem, the Organization Effectiveness Report, M24, provides an excellent tool for identifying those organization bench stocks that are accounting for the high due-out rate. The report identifies issue effectiveness, due-out release effectiveness, stockage effectiveness, due-out rate, and delayed due-out rate by individual bench stocks. This aids in narrowing the problem as only certain bench stocks might be causing the high due-out rate. The M24 report also relates the due-out rate to the stockage effectiveness for each organization. The manager can use this to evaluate whether the due-out rate is indicative of a low stockage effectiveness as discussed previously. The M24 also separates the due-out rates between demand determined bench stock items and bench stock items with MRAs. This will aid in analysis to determine if excessive use of MRAs is contributing to the high due-out rate.

Once specific problem bench stocks have been identified using the M24, a program can be developed to select bench stock items by organization and shop. This program can be used to identify specific items which might be resulting in the high due-out rate. Once specific items

are identified, action can be taken to improve the stockage position of the items.

Bench stock support is a critical area of base supply support. Bench stock items usually contribute directly to the accomplishment of the unit mission. Determination of the reason for high bench stock due-out rates is essential to effective supply support.

Excess Inventory

Supply stockage policies are based primarily on past customer usage (except for special levels, etc.). Therefore, stockage policies by no means will be 100 percent correct as past usage and future usage will vary. When future demands decrease significantly, excess inventory can accumulate. Major Merle Martin states:

> To a certain point, excesses are a natural and expected phenomenon in the Standard Supply System. The UNIVAC 1050-II stock leveling policy is based upon the assumption that future customer demand patterns will mirror part usage. While this is the only practical assumption now available to us, it is really only our 'best assumption.' For some items, demands will increase - for others, demands will decrease. Therefore, excesses are a natural result of our being unable to accurately predict the future [11:36].

The point Major Martin is making is that excesses will always exist; therefore, supply managers should concentrate their efforts in identifying and controlling excesses but not eliminating them.

Excess may be defined as partial excess or total excess. Partial excesses are identified for items which

have a requisitioning objective (RO) or for which demands have occurred within the last 365 days. The amount of assets above the RO level are considered the partial excess. For items which are general support division stock fund items with an RO of zero and demands within the last 365 days, the partial excess quantity is that quantity which exceeds the retention level (daily demand rate times 730 days). Total excess is measured for inactive items which are items with an RO of zero and no demands within 365 days. The entire amount of the assets represents the total excess.

Excesses may be measured either by dollar value or by line item. Both measures are important in evaluating the impact of excess inventory on the supply account and in taking action to correct the problem.

Measurement of excesses by dollar value is done primarily through use of the Stock Fund Stratification Program, M20. The program differentiates excess by budget code to identify system support division, general support division, etc., excess inventory. Line eight A through F identifies excess items by dollar values. Excesses are separated into six categories depending on whether the excess item is being retained for some reason or is being reported as excess to the source of supply and awaiting further action. The report is further differentiated by whether the asset is serviceable, unserviceable, due-in, or in due-in from maintenance status.

The significance of the dollar value of excess assets is the impact on the stock fund operating program. The stock fund operating program places limitations on the dollar value of inventory that can be maintained on hand in base supply. If a significant portion of this inventory is excess, supply support will suffer. As an example, assume the monthly inventory requirement for General Support Division stock fund items is $1,000,000. Further assume that excess on hand inventory is $300,000. This means that only $700,000 of inventory may be held to support active items that the customers are demanding. If excess can be reduced, more inventory may be applied to support the active items and therefore improve supply customer support.

Excesses may also be measured by line items. The M32 report contains an excess cause identification page which separates excess line items by 18 categories of causes and by General Support Division, System Support Division, or nonstock fund items. The page provides an excellent starting point in analysis for the cause of excess items.

Base supply has no control over some of the causes for excesses--such as stock number users directory changes or computer changes to item demand level. There are three causes over which the supply manager must maintain control with two being internal to the supply squadron and the other being the impact of customer actions. One factor internal to the supply squadron is the processing of receipt not

due-in items. In this case, supply has received an item for which no due-in to the source of supply exists. If there is no due-in for the item, it is possible there is no real requirement for the item being received and, therefore, the quantity received may be excess. Not all receipt not due-in items necessarily result in excess but the potential for creating excess remains high. AFM 67-1, Volume II, Part Two, Chapter 7, provides an excellent checklist for reviewing receipt not due-in items. It is important that stock control and receiving personnel research each receipt not due-in to determine the reason and use the data to identify possible causes.

Another potential internal source of excess is the use of special requirements indicator R on requisitions by stock control personnel. The use of the R indicator allows the requisitioning of assets above the level of the requisitioning objective. In this instance, each requisition using the special requirements indicator R creates partial excess of assets either on hand or on order. It is for this reason stock control is required to document use of the R indicator, attain approval of the Materiel Management Officer, and maintain approval letters on file for one year. The intended use of the indicator is for special projects but abuse of the use of the indicator can result from supply organizations trying to maintain excessive levels of stock. Since the R indicator allows requisitioning above the requisitioning

objective, it can be used to bypass Air Force controls on the amount of stock to be on hand and on order. The best method of control is for the Materiel Management Officer to ensure complete justification for use of the special requirements indicator R.

Customer due-out cancellations can impact on the amount of excess inventory. This area is discussed in more detail under urgency of need A and B cancellations; therefore, detailed analysis will not be repeated here. It is important the supply manager realize this is one area where he may have problems no matter which way he goes in his actions. The reason is that the manual requires a thorough validation by the customer of all his due-outs and requirements no longer needed to be cancelled. Yet this very requirement for cancellation may result in excesses if supply is unable to cancel the corresponding due-in with the source of supply. In this sense, the system, by promoting cancellation of due-outs by the customers, is building in a certain amount of excesses.

Probably the best corrective action for excess inventory is effective stock control. Review of the excess cause identification page of the M32 will provide the area to approach for evaluation of excesses. Effective management by stock control of the use of excess exception codes (EEX) is important. These codes prevent the automatic reporting of excesses to the controlling source of supply for possible

redistribution of the excess assets to other bases. Stock control is required to review items assigned EEX codes on a semiannual basis and this review should be thorough and well-documented. Excess redistribution programs have been established by several major commands. In one case, an equipment redistribution program is being used by three major commands whereby excess equipment items are "advertised" to other bases to see if there is a need for the items. A program of this nature might also work on a base level. The supply squadron, through use of a supply newsletter, could "advertise" excesses to base customers.

It is extremely important to try to prevent excesses from occurring instead of just reacting to it. The reason is the length of time built into the supply system for retention of excess items. If an excess occurs, the supply squadron will request disposition instructions from the applicable source of supply (with the exception of local purchase items). If no disposition instructions are received, supply must wait 365 days from the date of last demand or date of last adjustment before the item can be sent to disposal. Therefore, supply may have to hold the excess inventory for one year. It is evident to see that prevention of excess inventory is important.

Not Mission Capable Supply Indicators

Not Mission Capable Supply (NMCS) indicators attempt to measure how well the supply system supports the major

weapon systems at the base. The NMCS rate is the primary measure used to evaluate the supply support of the base weapon systems. NMCS rates measure the percentage of time a weapon system is not mission capable due to a supply shortage. Due-out cause codes are used by supply personnel to attempt to determine the reason for the NMCS condition so that corrective action can be initiated. Deletion codes identify the method used to terminate the NMCS condition. This section will discuss three indicators impacting on mission capability (MICAP). The NMCS rate will be discussed first and some of the problems in using this indicator as a measure of supply performance will be discussed. MICAP/Due-out Cause Codes will then be discussed with emphasis on codes B, H, and K. Finally, Deletion Codes will be analyzed.

NMCS Rate

As was mentioned above, the NMCS rate is considered the primary measure of how well the supply system is supporting the mission and contributing to operational capability. NMCS rates will be used for each weapon system on the base as well as for communications equipment and vehicle maintenance support. The NMCS rate is obtained from maintenance and is determined on a monthly basis by the following formula:

$$\text{NMCS Rate} = \frac{\text{Number of NMCS hours}}{\text{Number of available weapon system hours}}$$

The indicator measures the number of hours a weapon system cannot perform its mission due to lack of parts.

As an example, consider a fighter aircraft has a malfunctioning ejection seat. The ejection seat, as has all other subsystems on the aircraft, has been evaluated as to its impact on the capability of the aircraft to fly. In this case, an inoperative ejection seat would make the aircraft not mission capable. Assume after maintenance work on the ejection seat, it is determined that a part is needed to repair the set but this part is not available in base supply. Maintenance Materiel Control and Base Supply then conduct a verification process to ensure all possible base resources are checked for availability of the part, the demand is valid, and the part precludes the aircraft from flying any of its missions. If the condition is determined to be a valid MICAP condition, then MICAP reporting begins and NMCS hours begin accumulating. NMCS hours accumulate only after all maintenance actions on the aircraft are complete. If maintenance is still working on the aircraft when verification of a MICAP condition is completed, then NMCS time used in computing the NMCS rate does not accumulate. The aircraft would be reported as Not Mission Capable Both (NMCB) for supply and maintenance. Once a NMCS condition begins, the NMCS hours continue to accumulate until the part is received and released by base supply or maintenance

begins working on the aircraft (in which case the aircraft status would become NMCB).

The number of available weapon system hours is determined by the number of units in that weapons systems assigned to the base. Using the fighter aircraft example, if 30 aircraft were assigned to the base, this would be multiplied by the hours available in the month to get the total number of available hours. The total of all NMCS hours for the month is then divided by the total hours available (sometimes referred to as hours possessed) to get the NMCS rate.

The NMCS rate is determined primarily by three factors: the number of NMCS occurrences, the time required for supply to respond to an NMCS occurrence, and maintenance actions during the time of the NMCS condition.

The number of NMCS occurrences during the month has a significant impact on the NMCS rate. If there were no NMCS occurrences, then the NMCS rate would be zero. The reason for an NMCS condition is explained by MICAP/due-out cause codes. Cause codes explain whether or not the item is stocked by the supply system. Supply has no ability to control NMCS occurrences on items for which no previous demands exist. Actions can be taken on items which have previous demands and demand levels. Analysis of cause codes will be discussed in more detail later.

The best way to preclude NMCS occurrences for stocked items is to maintain adequate stock levels. Methods to

accomplish this were discussed under stockage effectiveness indicators. The important point to remember here is that a high stockage effectiveness will not necessarily ensure a low NMCS rate. Dawley and Feicht examined NMCS rates and seven types of supply issue effectiveness rates at 10 bases. They found no significant relationship between NMCS rates and issue effectiveness (4:50). Not all components of a weapon system are essential to the operation of the system; therefore, only certain items would contribute to the NMCS rates. Stockage effectiveness may be very high on these nonessential items resulting in a high overall stockage effectiveness. Yet, a few essential items may be difficult to obtain thereby resulting in a high NMCS rate. It is important supply personnel identify these items.

The Aerospace Vehicle and Selected Items of Equipment Mission Capability Report, D23, provides a daily summary of the prior day's MICAP transactions. It provides an excellent tool for daily management yet is not adequate from an overall program management perspective. At one of the author's previous base assignments, a local monthly MICAP summary program was developed. The five-part program provided an excellent method for identifying specific problem items creating MICAP conditions. Part one contained the following information by stock number and MICAP incident:

Standard reporting designator (SRD)

Number of incidents by cause code

ERRC code

Routing identifier

Item demand level

On hand quantity

Quantity due-in

Quantity due-out

Special level quantity

DIFM level

Quantity due-ins with positive status

Part two contained a summary of MICAP incidents by source of supply/routing identifier. Part three summarized the monthly MICAP/due-out cause codes by SRD. Part four was a deletion code summary by SRD. Part five contained general data which included total number of MICAP incidents, total number of line items, number of items on the listing with demand levels and zero balance on hand, and total number of items with positive due-in status. The program enabled supply personnel to specifically identify problem items.

The time required for the supply system to respond to an NMCS occurrence and obtain the part has the most significant impact on the NMCS rate. As an example, one item difficult to obtain from the source of supply may ground an aircraft for an entire month. If ten aircraft are assigned to the base, the one aircraft grounded for the entire month will give the squadron a 10 percent NMCS rate.

Much of the time frame required to backorder an NMCS part is not under the control of the base level supply squadron. Yet there are actions that can be taken to improve these time frames. First, ensure local MICAP personnel are expeditiously processing MICAP requisitions. Do they simply input the requisition into the computer and wait for the requisition to be sent to the source of supply or do they immediately call the requisition into the source of supply? Simply waiting for machine processing of the requisition will create a delay. Do MICAP personnel aggressively follow-up on requisitions or do they wait for computer status? Most depots take a minimum of 48 hours to process status through the computer. Telephone follow-ups are usually successful in getting information on asset availability. If status indicates the item is not readily available, the decision can be made to go to an alternative source of supply (lateral support or local purchase). The supply manager should know the length of time from creation of the NMCS condition until his MICAP personnel have communicated the need to the source of supply.

The method of transportation used to ship NMCS requirements can have a significant impact on the length of time for receipt of the requisition. Virtually all NMCS requirements are shipped by air, yet not all methods of air shipment are the same. The manager needs to know which method, such as log air, commercial air, pilot pickup, etc.,

provides the fastest service. Logistics Command depots prefer to ship by log air but will not always refuse to ship by other methods. Military Airlift Command Logistics Readiness Center has the schedule of all MAC flights, and it might be possible to obtain a pilot pickup of the needed part. Depending on the availability of transportation funds and the nearness of a major airport, commercial air may provide the fastest method. Whatever method is chosen, it is important to look at each individual NMCS requisition in making the decision. The aircraft may be grounded for a part but also in scheduled maintenance (NMCB status) for the next week. In this case it is not as critical to immediately obtain the needed part as when the aircraft is in NMCS status.

The final factor determining the NMCS rate is maintenance action during the time of the NMCS condition. Maintenance actions can significantly reduce supply NMCS time in two ways. Maintenance cannibalizations (CANNS) can reduce the number of aircraft grounded for parts. If three aircraft are grounded for different parts, it may be feasible to CANN the parts from one aircraft so that two may be made fully mission capable. Maintenance may also be able to change their planned maintenance schedule to do necessary work on the aircraft which is grounded for parts. In this case, the aircraft status becomes NMCB instead of NMCS. Some personnel consider the above action attempts to manipulate the NMCS

rate. Yet, if the goal is aircraft availability for the mission, both methods above will increase aircraft availability. In the first case, CANN actions returned two aircraft to service. In the second case, maintenance that would have been required anyway was performed while the aircraft was sitting idle awaiting parts. It is also important supply personnel understand maintenance limitations for CANN actions and rescheduling. It may not be possible to CANN the part. Manpower limitations may preclude CANNS as some CANNS take many man-hours. Flight schedule requirements may preclude the rescheduling of planned maintenance. Understanding these limitations will temper supply requests for CANN action or rescheduling and aid in improving supply-maintenance relations.

The NMCS rate is considered the single most important supply management indicator by most commanders. Yet is the NMCS rate a valid indicator of supply support? A 1977 study of two major commands was conducted to determine if there was a relation between aircraft NMCS rates and mission capability where mission capability is defined as the number of scheduled missions flown. They found there is

> . . . little relationship between NMCS rates and mission capability. Unless further studies are successful in revealing a substantial relationship, caution should be exercised by anyone attempting to associate a specific NMCS rate with a specific level of mission or operational capability [7:62].

The importance of the above is for the supply manager not to overreact to NMCS rates. Yet, as long as wing commanders

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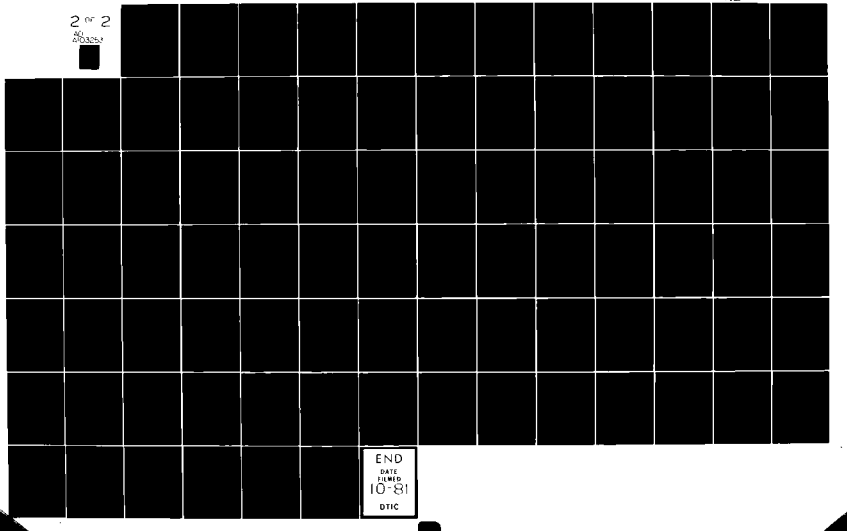

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view NMCS rates as the primary indicator of supply support, the supply manager must understand the indicator and know methods to improve NMCS rates.

MICAP Cause Codes

MICAP cause codes explain the reason for the back-order as determined by base inventory stockage policies. The codes will explain whether the item is either stocked or nonstocked and why the item was not available for issue. AFM 67-1, Volume I, Part One, gives three purposes of MICAP cause codes:

> 1. Advise the receiver of MICAP notification as to the base supply circumstances existing at the time of the MICAP request.
> 2. Provide a basis for after-the-fact generation of management statistics required to determine why MICAP conditions have occurred, what types of corrective actions are required (policy conflicts, system breakdowns, compliance, etc.), and by whom they should be accomplished.
> 3. Identify MICAP conditions caused by peculiar or special circumstances as high levels of management may designate [25:p.2-19].

The base level supply manager's primary concern is with purpose number two, determining why MICAP conditions have occurred and what types of corrective actions are required. Table 5-1 lists the cause codes.

The M32 report gives monthly totals for the twelve cause codes. Cause codes are divided into two groups designating whether the item is a stocked or nonstocked item. This analysis will not discuss in detail each cause code. The codes of primary concern to the supply manager are

TABLE 5-1

Mission Capable Cause Codes (28:pp.6-88 to 6-88A)

Code	Explanation
Nonstocked Items	
A	No stock level established - No demand or reparable generation prior to this request.
B	No stock level established - Past demand or reparable generation experience but Air Force base stockage policy precluded establishing level.
C	Item manager/system manager will not authorize a level.
D	Base decision not to stock level.
Stocked Items	
F	Full base stock - Depth of stock insufficient to meet MICAP/Due-out requirements.
G	Full base stock - Quantity necessary to satisfy this requirement is in AWP status.
H	Less than full base stock - Stock replenishment requisition exceeds priority group UMMIPS standards.
J	Less than full base stock - Stock replenishment requisition does not exceed priority group UMMIPS standards.
K	Less than full base stock - No due-in established.
R	Full base stock - Assets cannot be used to satisfy this requirement.
Special Purpose	
Y	Data not available on manually prepared start cards due to computer down for unscheduled maintenance.
Z	System/Commodity received without MICAP item (initial shortage).
1-6	Command unique.

codes B, H, and K and these will be analyzed in detail. Codes B, H, and K will indicate a possible change in customer requirements, deteriorating depot level support, or errors by supply personnel.

MICAP cause code B indicates that past demand for the item has occurred yet base stockage policy precludes establishing demand levels. For repair cycle items, two demands per year are required before items are eligible for demand levels. For EOQ items, the number of demands needed is dependent on the stockage priority code but at least three recurring demands per year must occur prior to establishing a demand level. Cause code B is telling the manager that prior demands have occurred within the last year yet not enough demands to warrant establishment of demand levels based on stockage policies. For the four major commands, from which data has been accumulated for fiscal year 1980, MICAP cause code B due-outs account for between 16.3 percent and 22.3 percent of all monthly MICAP incidents.

It would not be practical to try to prevent cause code B occurrences. Yet, an effective program can be established after the occurrence to aid in precluding possible future MICAP incidents. Utilizing a local MICAP program discussed earlier, a monthly review of MICAP cause code B incidents should be initiated. The review program would be based on the idea that cause code B incidents indicate past usage and potential future usage for the item. The program

entails sending a listing of the prior months MICAP cause code B items to maintenance materiel control. Materiel control personnel review the listing and route it to the specific maintenance shop which requested the part. Shop chiefs will review each item and use their judgement and experience to determine if they will be requiring the listed part in the future on a recurring basis. If so, they would return the listing with information as to expected usage through materiel control to base supply. Base supply can then take action to initiate a demand level on the items selected.

Extreme care should be used in running the program. Although AFM 67-1, Volume II, Part One, states that "significant changes in demand rates will be analyzed and stock levels adjusted, where needed to offset excesses or shortages [24:p.11-5]," the establishment of unneeded levels could result in a degradation of support to other bases. It is important that qualified maintenance personnel review the listing to preclude abuses of the program. Effective use of the program will result in earlier establishment of demand levels on needed items and may preclude future MICAP incidents.

MICAP cause code H indicates a potential support problem from the source of supply. A demand level exists for these items yet less than full base stock is available. In addition, a stock replenishment requisition has been submitted

to the source of supply but the time required to receive the item has exceeded the UMMIPS time standard. (Standard times were discussed under stockage effectiveness.) There may be many reasons why stocked items are not being received by the base within standard time frames to preclude cause code H incidents. Repair considerations, short stock position, and methods of stock leveling are all possible reasons for lack of depot support. Excessive transportation time or items requiring specialized packaging or handling may also impact on receipt time. Adjustment of order and ship time may provide a long run solution but continued MICAP incidents require short run answers.

The first step in a possible solution is to identify the items involved and their source of supply. This can be done through use of the local program discussed earlier. Once the item and source of supply are identified, find out the specific reasons for the delays and the expected "get well" date. If the "get well" date is in the extended future, two alternatives exist. If feasible, get approval and attempt base level repair on the item. If repair is not possible, then try any other possible sources of supply to include lateral support to other bases (do not forget overseas bases) and local purchase. A case occurred at one of the author's previous assignments where a reparable item was causing code H incidents. The reason for the delays was the failure of items being repaired to pass a certain

inspection. Through aggressive action by MICAP personnel, six complete units were found sitting and collecting dust at an aircraft manufacturer's warehouse. Obligation authority was obtained from the depot to purchase the items with depot funds and six new assets were added to the supply system inventory. So, do not overlook these commercial sources as many EOQ type items are common to both military and civilian aircraft. Also, some aircraft have civilian counterparts as far as the basic aircraft is concerned (KC-135 and Boeing 707). The important point is to try all possible sources to obtain the needed item while following prescribed procedures.

Cause code H incidents account for a significant amount of the total MICAP incidents. Appendix B shows the monthly percentage of cause code H incidents for the four major commands. The percentage of cause code H incidents varies from 26.8 percent to 35.0 percent of all MICAP incidents and are the single largest category. It is very apparent this is an area for management attention.

If a MICAP incident occurs for a stocked item, less than full base stock exists, and no due-in is established, the computer will record the incident as a cause code K. AFM 67-1, Volume I, Part One, states that "if a stock replenishment request is not outstanding, the base is at fault [25:p.2-20]." The authors do not necessarily agree with this statement. A previous requisition may have been

cancelled and a requisition exception code (REX) 1 assigned to the stock number as a result of processing status from the source of supply. This would result in a cause code K incident if the REX code had not yet been researched and removed by stock control personnel. Although assignment of the REX code 1 by the source of supply may have been due to an error by base supply personnel on the initial requisition, a REX code 1 can be assigned despite a correct initial requisition. The point here is to get supply managers away from the consistent idea that a cause code K incident denotes error by base level personnel. The important thing to do is not to point blame but to correct the reason for the cause code K incident.

Research of each individual cause code K incident is needed. MICAP personnel should forward a copy of an inquiry on the item which resulted in the incident to the requisitioning supervisor when the incident occurs. The requisitioning supervisor should research the incident to determine the reason and, once research is complete, action should be taken to remove any restrictions on stock replenishment. Effective REX code management is also important, as reduction and control of REX codes can preclude cause code K incidents.

Cause code analysis is a very effective method to determine the reason for MICAP incidents and to provide information for corrective action. It is essential a program of review and analysis of MICAP cause codes be used. The

program should yield dividends by reducing the number of MICAP incidents and thereby reducing the NMCS rate.

MICAP Deletion Codes

Knowing how MICAP incidents are terminated is important for the effective management of the MICAP program and control of the NMCS rate. MICAP deletion codes identify the reason for termination of the MICAP incident. The codes indicate that the item was either received and due-out released to the organization, issued from war reserve material (WRM), cannibalized from one aircraft to another, or cancelled due to an error or other reasons. Table 5-2 contains MICAP deletion codes and their descriptions. Appendix B contains some deletion code data for selected codes.

Deletion codes 1, 2, 3, and 5 indicate the MICAP item was obtained from an off-base source such as AFLC depot, lateral support from another base, or local purchase. These codes will tell the manager what source of supply is providing him with most of his MICAP requirements. If, based on local studies, lateral support had proved to be the quickest method of obtaining MICAP items, the manager would want to see a high percentage of delete code 3 terminations. The local MICAP summary program discussed earlier is also helpful since it summarizes deletion codes by standard reporting designator (SRD). As an example, if a specific SRD is supported primarily by an AFLC Air Logistics Center, yet the

TABLE 5-2

Mission Capable Deletion Codes (28:p.6-89)

Reason for Deletion	Code
Received from Air Logistics Center	1
Received from Defense Logistics Agency/Other Services	2
Satisfied through lateral support	3
Cannibalization has been used to preclude the MICAP occurrence	4
Receipt of base procured item	5
Received from base assets	6
War Reserve Materiel has been used to meet requirement	7
Cannibalization has been used to satisfy MICAP requirement	8
Reported in error	9
Cancellation of MICAP when deletion codes 1-9 do not apply	Ø

deletion code summary indicates most MICAP requirements are being filled from lateral support or local purchase, this may indicate a support problem for that weapon system and source of supply. Also if many needs are being filled via lateral support for a specific weapon system, this indicates that other bases which possess the system have stocks to support the system. The manager would question why his base does not have the stock. Other examples could be given, but the important point is that the supply manager know what source of supply is providing primary support for MICAP requirements.

Deletion code 6 indicates the MICAP requirement was fulfilled from base assets. A good example of this would be when an existing end item is in awaiting parts (AWP) status to be repaired on the base when a MICAP incident occurs for the end item. If prior to receipt of the MICAP requisition the parts are received and the AWP end item is repaired, the MICAP incident would be terminated with a deletion code 6.

Deletion codes 4 and 8 indicate that cannibalization action has been taken by maintenance either to preclude the MICAP occurrence or to satisfy the MICAP requirement. Cannibalization occurs when maintenance removes a part from one aircraft to fix another. Maintenance job control authorizes cannibalizations and approval is by the maintenance control supervisor. AFR 66-1 states cannibalizations may

be approved "when a part is required that cannot be delivered and installed in time to make a scheduled launch . . . [21:p.2-11]." Cannibalizations can require a significant amount of maintenance man-hours to accomplish and, therefore, should only be done when absolutely necessary. Cannibalization is a maintenance decision but supply personnel can aid in this decision by providing maintenance with the most current and accurate status on MICAP requirements. It is easy to understand maintenance personnel irritation when many man-hours have been spent cannibalizing an item and then the MICAP requisition is received an hour later. The number and percentage of cannibalizations is important to the supply manager as it can be a good indicator of maintenance and supply relations and cooperation. If maintenance personnel feel supply MICAP personnel are doing everything possible to obtain the needed parts, they may be more inclined to cannibalize and thereby help supply reduce its NMCS rates.

MICAP requirements may be filled by withdrawal of assets from War Reserve Materiel. When this happens, deletion code 7 is assigned. Due to the criticality of WRM, the withdrawal of WRM assets must be tightly controlled. Withdrawals may be made only to relieve verified MICAP conditions and the withdrawal of the asset must result in the aircraft/weapon system being returned to a mission capable condition. To explain this, an aircraft may be NMCS for three parts,

and one part might be in a war readiness spares kit (WRSK); yet a withdrawal should not be authorized in this instance as the aircraft would still be NMCS for two other parts. Another factor to consider is the need for the aircraft. Even with a NMCS aircraft, the wing may still have enough aircraft assigned to meet its flying requirements. Therefore, withdrawal from WRM should not be recommended.

Data on this indicator will give managers a view of potential abuses of withdrawals from WRM. If a high percentage of deletion code 7 terminations are occurring, the WRM spares might become another "source of supply" for maintenance and the spares may not be available if needed for a contingency.

MICAP deletion codes Ø and 9 indicate that a MICAP requisition was submitted and later cancelled by the base. Deletion code 9 indicates an error by the base in reporting the MICAP. This usually indicates a breakdown in the verification process or incorrect data was submitted with the requisition. Breakdown in the verification process could occur in many ways. Maintenance could have failed to check bench stock assets. Supply personnel could have failed to check the receiving line or for next higher assemblies. The verification process assures that the item is not available from base resources. Failure to complete the process can result in a requisition being submitted when assets are available on base. Then the requisition must be cancelled

when the asset is "found" and many man-hours and money might have been wasted processing the MICAP requisition. Deletion code 9 terminations may also occur due to incorrect reporting of data by supply. This is primarily a quality control problem for MICAP personnel.

Deletion code Ø is used when codes 1 through 9 do not apply. AFM 67-1, Volume I, Part One, gives some examples of use of deletion code Ø:

> 1. An aerospace vehicle or selected item of equipment being reported as MICAP is transferred prior to receipt of the required part.
> 2. An uninstalled engine being reported as engine MICAP is returned to the depot for overhaul in lieu of base repair [25:p.2-13].

MICAP deletion codes are a very useful indicator in managing a MICAP program. If problems exist, the manager must know how his MICAP requirements are being filled, and MICAP deletion codes give the manager this information.

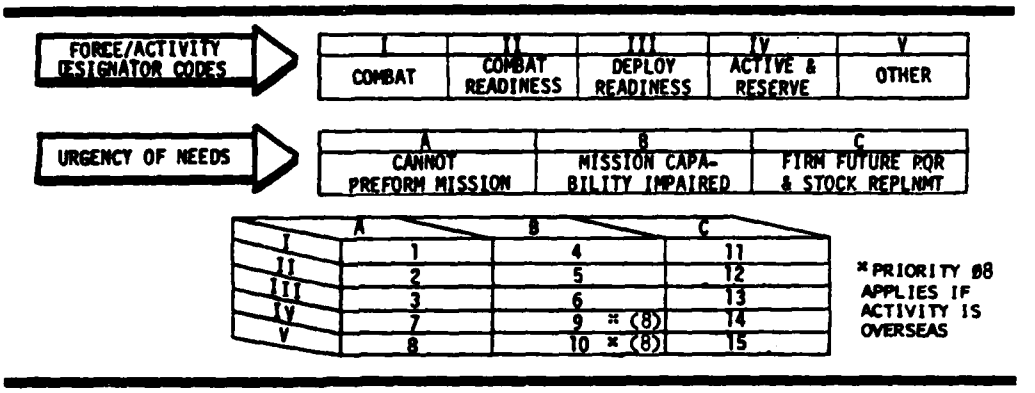
Priority Support Indicators

Priority support indicators measure how well the supply system is responding to urgent requests by customers. These indicators determine the relative importance of the item in the requisitioning, movement, and issue of materiel. The basic framework for the supply priority system is the Uniform Materiel Movement and Issue Priority System (UMMIPS). The UMMIPS provides the basis for determining the relative importance of an item that is backordered by base supply from its wholesale source of supply (excluding local purchase

through base contracting). The system, in order to facilitate efficient requisitioning and materiel movement, uses a two digit numeric code (Ø1 to 15) called a priority designator.

The priority designator of a requisition is based on the Force Activity Designator (FAD) and the Urgency of Need (UND) (see Figure 5-1). The FAD is a means for the Secretary of Defense, the Joint Chiefs of Staff, or the Department of the Air Force (USAF) to assign a ranking or value of importance to military units, activities, or projects as they relate to overall national defense. The FAD is derived from precedence ratings contained in the Headquarters USAF Program Document which is a classified source document explaining the authority and responsibility for assignment of the FAD. The UND indicates how urgently the organization requires the materiel ordered. The varying degree of urgency is expressed by the letters A, B, and C. Figure 5-1 shows the UNDs and the corresponding justification for their use. As can be seen in the figure, UND A represents the highest need (cannot perform mission) followed in importance by UND B and UND C.

This section of the paper will discuss three indicators that measure the effectiveness of priority support. First, priority due-outs will be discussed with the focus on UND A due-outs over 30 days and UND B due-outs over 60 days. Second, the priority requisition rate and its effect on the



PRIORITY		ORDER AND SHIPPING TIME (DAYS)	
GROUPS	DESIGNATORS	CONUS	OVERSEAS
1	1-3	8	12-13
2	4-8	12	16-17
3	9-15	31	69-84

UNIFORM MATERIEL MOVEMENT AND ISSUE PRIORITY SYSTEM (SOURCE: DOD DIR 4410.6)

FORCE ACTIVITY DESIGNATORS FOR AIR FORCE AND MAP ACTIVITIES AND PROJECTS ARE DERIVED FROM PRECEDENCE RATINGS ASSIGNED BY USAF (AFOAP) AND PUBLISHED IN THE CURRENT HQ USAF PROGRAM DOCUMENTS

Fig. 5-1. UMMIPS (28:p.6-22)

supply system will be analyzed. Finally, UND A and UND B due-out cancellations will be discussed.

Priority Due-Outs

The priority of a due-out is determined by the organization's use of the UND. UND A and UND B are considered priority due-outs due to their impact on the organization's performance of its mission. A priority due-out is created when a UND A or B request is submitted by an organization to base supply and the asset is not available for issue in the quantity needed. The percentage of UND A and B due-outs is used as a measure of the percentage of priority due-outs. The formula is:

$$\text{Percentage of Priority Due-Outs} = \frac{\text{Number of UND A and B due-outs}}{\text{Total due-outs}}$$

This indicator, along with other indicators, provides an indication of potential stockage problems. Due-outs are a predetermined part of the supply system based on the stockage policies established. Yet, a high percentage of UND A and B due-outs for normally stocked items indicates supply is not stocking items most critical to the customer's mission. (For a discussion on this area, see MICAP due-out cause codes).

One should keep in mind that priority UND A and B due-outs do not necessarily correspond to the priority of the requisition/due-in. Looking at Figure 5-1, it can be

seen how the combination of the UND and the FAD determine the priority designator use for requisitioning. The figure also shows how priority designators are separated into three priority groups. Depot handling and processing of requisitions is based on these priority groups with groups one and two getting priority handling whereas group three is considered a routine requisition. In looking at the combined FAD and UND table, UND B due-outs with an organization FAD IV and V results in requisition priorities of Ø9 and 10 which are priority group three routine requisitions. Therefore, even though the UND B due-out is considered a priority, the corresponding requisition in this case is considered a routine requisition by the depot. It is important supply managers understand this contradiction and convey this understanding to organizations which have FAD IV and V assigned.

The UND A due-outs over 30 days indicator displays the percentage of UND A due-outs over 30 days old. Materiel requested using UND A is required for immediate use and is essential to the performance of the mission. The formula used to compute UND A due-out over 30 days old is:

$$\text{Percentage of UND A due-outs over 30 days} = \frac{\text{Number of UND A due-outs over 30 days}}{\text{Total number of UND A due-outs}}$$

The UND B due-outs over 60 days indicator depicts the percentage of UND B due-outs older than 60 days. Materiel requested using UND B indicates that lack of this materiel

impairs, but does not prevent, the ability of the organization to perform its mission. The formula used is:

$$\text{Percentage of UND B due-outs over 60 days} = \frac{\text{Number of UND B due-outs over 60 days}}{\text{Total number of UND B due-outs}}$$

One potential cause for an excessive number of UND A and B due-outs exceeding 30 and 60 days is the incorrect assignment of the UND by the organization. One must have serious doubts when an organization assigns an UND A to a due-out (which means it cannot perform its mission) and that due-out is over 30 days old as it is doubtful the organization could have gone 30 days without being able to perform its mission.

Corrective actions consist of involvement by both the requesting organization and base supply. Failure by the organization to properly review and validate due-outs on the Priority Monitor Report, D18, and the Due-Out Validation, M30, can increase the number of priority due-outs and increase the potential for due-outs over 30 and 60 days. Commanders have an inherent responsibility to exercise supply discipline and to effectively manage resources within their organizations. This responsibility includes efficient planning, forecasting, and submission of supply requirements needed. This includes requesting items far enough in advance of the need to preclude the use of a UND A or B due-out. Review and verification procedures themselves have a

significant impact on the number of UND A and B due-outs. Proper verification procedures by knowledgeable personnel can ensure items requested actually impair or prevent mission accomplishment. Requested items may be located in bench stocks, supply points, or war readiness spares kits. It may also be feasible to cannibalize the needed item from another like system. Proper verification procedures which check for the availability of the item before backorder can result in a significant reduction in the number of priority backorders.

Thorough organization review of the Priority Monitor Report, D18, can also aid in the reduction in the number of priority due-outs. This report contains all the organization's priority due-outs and is produced daily for UND A due-outs and weekly for UND B due-outs. Proper review of this report by the organization and base supply can ensure appropriate action is taken to follow-up, cancel, or change requisitions for priority due-outs.

Supply managers need to ensure that customers comply with verification procedures for UND A due-outs. Individuals who verify these requests should be designated in writing by their commander with a copy of the letter on file in the Demand Processing Unit. Supply personnel should ensure the Urgency Justification Code (UJC) is consistent with the request for an item. The UJC is a two-digit alpha/numeric code used on customer requests to determine the urgency of need and type of requirement (28:p.8-32). The quantity of

materiel requested should be consistent with the priority of the request. As an example, an organization may need a particular part to repair a weapon system. The organization should request on a priority the number of parts required to repair the system, but cases have occurred where only one unit of an item is needed yet more than one is ordered on a priority in anticipation of future needs. Only the one unit should have been ordered on a priority while the other four should be ordered on a routine request. Supply Demand Processing personnel should challenge any unusual request such as this.

Additionally, the supply manager should ensure stock control personnel take the required follow-up action on requisitions for UND A and B due-outs over 30 and 60 days. Figure 5-1 shows the order and shipping time standards for the three priority groups for items normally stocked at the depot. Priority group one standard is eight days and priority group two standard is twelve days for bases in the continental United States. Therefore, it seems that UND A and B due-outs over 30 and 60 days in length represent an excessively long time for the depot to satisfy the requisition and may indicate a support problem with the depot. Stock Control should initiate aggressive follow-up action to determine the reason for the delay as it may be feasible to go to an alternative source of supply. Personnel can use the Selective

Readout, R32, program along with the D18 program to identify these older due-outs.

Effective training of base supply customers can also provide an invaluable aid to control the use of UND A and B due-outs. This training should include not only the impact of misuse of the priority system on the local base, but its impact on the overall defense distribution system.

The customer also needs a general understanding of the stockage policies used by the supply system. This general understanding will enable the customer to more effectively plan his needs to help preclude use of priority due-outs.

Priority Requisition Rate

The requisitioning system allows base supply to request materiel to satisfy customer due-outs and to obtain assets for stockage in base supply in anticipation of customer demands. The requisition serves as a communication interface between the Standard Base Supply System and the wholesale source of supply. The level of support and service provided by the source of supply is determined by the priority of the requisition. (See Figure 5-1 and earlier discussion on how the priority of a requisition is determined.) A priority requisition has a priority designator of Ø1 through Ø8 assigned. The priority requisition rate indicates the percentage of priority requisitions submitted to all sources

of supply. The formula is:

$$\text{Percent of priority requisitions} = \frac{\text{Total priority group one and two requisitions}}{\text{Total requisitions}}$$

Abuse of the priority system can have a significant effect on the entire logistics support system. Major Merle P. Martin stated:

> The greater the proportion of priority requisitions to total requisitions, the less time and assets available for stock replenishment requisitions. This leads to more empty shelves which then leads to more priority requisitions to satisfy customer backorders. This priority "loop" becomes endless [11:33].

The number of priority requisitions is primarily determined by the number of priority due-outs (UND A and B due-outs). The reasons for a significant number of priority due-outs can be attributed to customer abuse of the use of the UND or poor supply stockage. These areas were discussed earlier under the priority due-out indicators.

Another factor which may be impacting on the number of priority requisitions is abuse of the system by supply personnel through the priority requisitioning of stock replenishment needs. One way to determine this is to look at the percentage of priority due-outs as compared to the percentage of priority due-ins. If the percentage of priority due-ins has increased significantly while the percentage of priority due-outs has not, then it is possible stock replenishment requisitions are being submitted as priorities. Another method would be to compute a ratio of the number of

UND A and B due-outs for the month compared to the number of priority requisitions for the month. Caution must be used in analysis of this ratio as UND B due-outs for organizations with a FAD IV or V do not result in priority requisitions. A low ratio would indicate priority requisitions are being submitted for other than priority due-outs.

Two management products are available to assist in the control of priorities. The Priority Monitor Report, D18, and the Base Supply Surveillance Report, D20, are valuable aids to controlling priority abuse. Support of the Chief of Supply and the Deputy Commander for Resource Management in the submission of priority abuse letters to customers is important. Review and analysis of priority abuse letters may provide a pattern to identify specific organizations which may be abusing the system. Customer training can also provide an aid to reducing abuses. If the supply customer does not understand the basic operation of the system and the potential impact of abuses, he will not be concerned with using the correct priority. Remember, the smaller the number of priority requisitions, the better service given to all requisitions.

UND A and UND B Due-Out Cancellations

Due-out cancellations can cause significant problems for base supply. Cancellation of UND A and UND B due-outs only further extend the problem. These cancellations can have several impacts on the supply system as there is a

significant chance for the creation of excess inventory. UND A and B due-outs get priority handling for requisitioning of the item, and in many cases it is only a few days from submission of the requisition to the source of supply before the item is shipped to the base supply account. Once the item is shipped it will not generally be returned to the source of supply. If the due-out is cancelled after shipment and no other requirement exists for the item, it will become excess inventory. (See discussion on excess inventory.) Another impact is the cost of processing UND A and B due-outs and the resulting priority requisitions. Since these are considered priority requests, they do get expeditious handling and review, and numerous man-hours are used to process and follow-up on these items. Indiscriminate cancellations result in the wasting of these resources.

There may be several causes for excessive UND A and B due-out cancellations. Customers may order an item when they are not really positive they want the item. Base supply managers have tried to build an image of the base supply account operating similar to a commercial retail establishment. In commercial establishments, it is sometimes commonplace for customers to order an item only to cancel the order before receipt of the item. This attitude may carry-over to base supply customers. Incorrect orders may also result in due-out cancellations. The incorrect orders may be as a result of customer error in requesting the item

or as a result of an error by base supply in recording the request or in requisitioning the asset. Finally, poor status on the requisition corresponding to the due-out may result in a cancellation. If the customer is told he will not get an item for six months, he may decide to cancel the due-out and use the funds somewhere else as opposed to tieing up the funds for six months. This can become especially evident when the time frame discussed extends into the next fiscal year. A customer may order an item in the present fiscal year with the expectation of receiving the item in the present fiscal year. If requisition status indicates the item will not be received until next year, the customer may cancel the due-out with the reason being that if the item is received in the next fiscal year, it must be paid for in next year's monies. The only exception is when due-outs are obligated thereby committing present year funds, but this is usually only approved for special projects.

There are several courses of action available to the supply manager to overcome excessive UND A and UND B due-out cancellations. Probably, the most important action is to challenge questionable customer requests that create UND A and UND B due-outs. This would entail questioning large unit quantities on priority requests, and since UND A requests must be verified, supply should ensure that only proper personnel complete the verification. Prevention of questionable customer requests can reduce the number of later cancellations.

Another action would entail proper research on items requested. If the customer requests an item without knowing the stock number for the item, supply personnel must conduct research to try to find the proper stock number. If the research is done improperly, the wrong item may be ordered. When the mistake is realized, a due-out cancellation is required for the incorrect item, or, if the incorrect item is received, a customer refusal will result. Proper and thorough research will help prevent this from occurring. A thorough and accurate due-out validation program can also reduce unnecessary due-out cancellations. A point should be made that not all due-out cancellations are errors. The customer is following correct procedure when he cancels due-outs on his M30 validation for items he no longer needs. The question can be raised as to why the items were back-ordered on a priority and now the customer no longer needs the item. This question should be asked during the validation process. If records are maintained of priority due-out cancellations by organization from results of the validation program, these records may be used to identify specific organizations that may be causing the high cancellation rate. The final corrective action that should be recommended anytime a supply customer is involved is effective customer training. The training should not be oriented to the details of the cancellation process as these details are available in manuals, but emphasis should be placed on the impact on

the supply system of indiscriminate due-out cancellations and the potential for reducing customer support.

One final area should be discussed that has impacted on due-out cancellations in the past but will soon change. September is the last month of the fiscal year and many organizations may experience a shortage of operating funds during the last days or weeks of the month. If a customer's due-out is received and the organization has no operating funds (organizational and maintenance money), the supply computer system will automatically cancel the due-out. In some instances, this scenario has resulted in a large number of due-out cancellations. In July 1981, a new program is being implemented to alleviate this problem. Under this new program, due-outs will not be cancelled but a transaction exception code will be assigned to indicate the due-outs were not released to the customer because of insufficient funds (23:2). These due-outs may then be reviewed later if operating money becomes available (commonly called fallout funds). The new program will help eliminate the automatic cancellations that have added significantly to the workload of not only supply personnel but the customer as well.

Warehouse Storage Indicators

Four indicators will be discussed in this section. Serviceable balance with no warehouse location, warehouse refusals, overall inventory accuracy and items past due inventory.

Serviceable Balance With No Warehouse Location

This indicator measures the number of item records that have a serviceable balance on the UNIVAC 1050-II computer with no warehouse location assigned. As a result of the computer not having a storage location for these items with a serviceable balance, the items are not recorded as being stocked for customer requests. The formula used to compute this indicator is:

$$\text{Percentage of items with a serviceable balance and no warehouse location} = \frac{\text{Number of items with a serviceable balance and no warehouse location}}{\text{Total item records}}$$

This indicator identifies a problem that may be occurring in several supply areas such as supply points, individual equipment, and base service store in the Customer Support Branch, Materiel Storage and Distribution Branch, and Munitions and Special Assets Sections of the Materiel Management Branch. The Serviceable Balance No Warehouse Location Program, R36, lists the applicable items. Copies of the listing are forwarded to the appropriate storage functions for corrective action. Each item with a serviceable balance and no warehouse location is required to be annotated with a warehouse location or other transaction number within three days. Actions required by the various storage functions along with the short processing time can impact on this indicator. The number of times the R36 is run each

month also effects items with a serviceable balance and no warehouse location. Processing the R36 once or twice monthly will not provide the timely identification of items with a serviceable balance and no warehouse location.

Management should ensure that timely and aggressive actions are taken by the appropriate branch to assign a warehouse location to each item on the R36. A coordinated effort between the various branches is vital for effective customer support. The Procedures and Standardization (P&S) Section of the Management and Procedures Branch should ensure corrective actions are taken on no location items within the three day criteria. This action is accomplished through constant P&S monitoring and surveillance of the program.

Processing the Serviceable Balance No Warehouse Location Listing, R36, weekly insures that items are identified promptly and provides a method to ensure corrective actions are taken. Weekly processing of the R36 also provides feedback to the supply manager. That is, if a warehouse location or a special inventory transaction is not assigned to each item on the R36, the same item will be listed the next time the R36 is run. Several actions may be taken to determine the warehouse location. Personnel should research the bin notice file to determine if a bin notice is on file with a warehouse location. Other actions include checking the receiving line to ensure that a receipt was not

processed without the item being physically received. Hold bays and tote boxes in the Receiving Section should be checked daily to determine if there are delays in final processing of items with no warehouse location. Theft of items from the receiving line also impacts on this indicator and should be evaluated. Finally, a special inventory may be requested if the item location cannot be determined.

Warehouse Refusals

This indicator measures the number of occurrences of receipt of an issue or shipment document in the warehouse with an insufficient item quantity to satisfy the total number of items needed. The data presented on the transaction summary page of the M32 represents the actual number of warehouse refusals.

Inefficiencies in the Receiving Section may result in warehouse refusals. For example, an incorrect quantity entered on the Receipt (REC) document by receiving personnel affects the serviceable balance on the computer. Pilferage from the receiving line after the REC has been processed is also a factor. The two examples cited will cause a warehouse refusal if there is an issue or shipment requirement and the quantity available is not sufficient. There are other factors that also affect this indicator -- such as warehouse personnel placing items in the wrong warehouse location, haphazard assignment of reserve storage locations, and failure to delete reserve locations when they are no

longer required. Duplicate storage locations for items may also impact especially when warehouse personnel are not aware of their existence.

Aggressive management of this indicator will prove to be very significant in maintaining and achieving a high level of customer support and confidence. Supply managers should establish controls to ensure that reserve locations are only created as a last resort, and that prompt deletion action is taken when the requirement no longer exists. In addition, the number of warehouse refusals in a particular warehouse can be a signal to the supply manager that specific problems exist. For example, a large number of warehouse refusals from a stockroom containing sensitive items or items with a high personal use appeal could indicate theft, or a large number of warehouse refusals in a stockroom with several newly assigned unskilled personnel could indicate a need for increased training.

A review of the entire warehouse security system may be required to ensure that unauthorized personnel are not entering or removing property from the warehouse. Also, only highly qualified individuals should be assigned to work on the night shift. This type of assignment action may eliminate the possibility of the night shift personnel carelessly pulling and returning property to incorrect War Readiness Spares Kit (WRSK) locations or warehouse bins. Having qualified and dedicated individuals assigned to the night

shift may also eliminate the possibility of issuing property to organizations without issue documents. Warehouse personnel sometimes believe that their jobs are unimportant, and mistakes occur because no one seems to care. Therefore, management should make a periodic walk-through of the warehouse and encourage their personnel. This type of action may help to assure the personnel that their jobs are important.

The normal processing of the Warehouse Validation option of R36 program identifies duplicate storage locations only within the span of location requested. This leaves the possibility of other duplicate storage locations remaining undetected for a long period of time. Therefore, the options available with the R36 program should be used to identify "all" duplicate storage locations in the entire supply account. This may be an effective management tool to help ensure that a thorough warehouse location validation is accomplished and warehouse refusals are decreased.

Overall Inventory Accuracy

This indicator is very important in the management of the entire supply account. Inventory accuracy is computed by category of property, and these categories are repair cycle, economic order quantity, equipment in warehouse, and equipment in use. The formula used to compute inventory accuracy is:

$$\text{Inventory Accuracy} = 100\% - \frac{\text{Total units over and short}}{\text{Total computer recorded balance}}$$

The inventory accuracy records are printed on the Consolidated Inventory Adjustment Document Register, M10, and the Monthly Base Supply Management Report, M32. The inventory accuracy figures indicated on the M32 are cumulative as of the beginning of the fiscal year. Monthly trends can be computed by subtracting the previous month's figures from the current month and applying the inventory accuracy formula.

Inventory accuracy is also impacted by inventory adjustments. The inventory adjustment system provides a means to correct the computer recorded balance when there is a difference between the quantity of assets physically on-hand and the quantity indicated on the computer records. The documents used to request an inventory adjustment are recorded in the computer on inventory adjustment records. These records are provided monthly in the consolidated Inventory Adjustment Document Register, M10. This management report assists supply managers in evaluating the accuracy of the supply account and identifying areas where adjustments are being made so corrective action can be taken. The Inventory Section obtains supporting documentation which may consist of a report of survey, discrepancy in shipment report, cash collection voucher, statement of charges for government property, lost, damaged or destroyed, or a

completed research worksheet. This supporting documentation is attached to the M10.

Supporting documentation attached to the M10 should accurately reflect circumstances surrounding the discrepancies. Additionally, the M10 and supporting documentation should be forwarded to the Management Analysis Section for review and identification of possible unfavorable trends occurring in a particular section or warehouse. Problems and trends identified as a result of management analysis review should be briefed monthly at the Chief of Supply "How Goes It."

Constant management attention to the processing of inventory adjustment is essential because of the impact the adjustments have on the entire supply system. Correct adjustments ensure that the computer recorded balance corresponds to actual on-hand assets. Valid recorded balances result in realistic asset reporting for requirements computation and stock releveling. Erroneous shortage adjustments of the recorded balance may cause excessive ordering and other requisition problems. Erroneous overage adjustments may cause warehouse refusals, insufficient requisitions, and subsequent failure to provide customer support (25:p.6-93).

Finally, inventory accuracy can also be checked by reviewing quantities in a small sample of warehouse locations. This procedure requires a computer inquiry indicating the recorded serviceable balance and the warehouse location.

The recorded balance can then be validated with the actual on-hand balance to determine if discrepancies exist. This procedure may be able to quickly identify potential problem areas affecting inventory accuracy and initiate corrective action. The validation method is an excellent management and surveillance tool for an immediate analysis of a particular stock room or warehouse.

Thorough analysis of the inventory accuracy indicator is of the utmost importance to the supply manager for several reasons. The M32 Inventory Accuracy Stratification section may indicate a high inventory accuracy percent, when in fact, there is a considerable difference between physically on-hand and recorded balances. The cumulative aspect of the inventory accuracy figures is another reason for its importance. For example, an incorrect count by the Inventory Section during a complete/cycle inventory may result in a low inventory accuracy rate and take two or three months before the rate returns an acceptable level. One way to ensure that correct counts are made when conducting these inventories is to ensure that the inventory section is not under an excessive workload by having a large number of inventories to conduct.

Items Past Due Inventory

This indicator measures complete/cycle inventories which have a date of last inventory (DOLI) greater than

365 days. The formula used to compute this indicator is:

$$\text{Percentage of Items Past Due Inventory} = \frac{\text{Number of items past due inventory}}{\text{Total number of item records}}$$

The number of items past due inventory and total item records for both supplies and equipment can be obtained from M32 Item Record Data page. Managers should determine how many items are delinquent or the percent of items behind schedule and ensure that the Inventory Section takes corrective action to resolve these delinquent items.

The selective readout program, R32, available on the UNIVAC 1050-II computer, can provide a product to help inventory personnel identify items that are close to being delinquent. An option available with the selective readout program allows for the selection of items, with a date of last inventory (DOLI) greater than 350 days. This selection option helps to identify items earlier so that corrective action can be taken before items appear as past due inventory. Regardless of the technique used, complete/cycle inventories should be scheduled and accomplished thoroughly and accurately so that discrepancies identified can be corrected in an orderly and complete manner.

Repair Cycle Asset Support Indicators

This section will be devoted to a general discussion of the repair cycle control program with explanations of the importance of the program to the supply system and

recommended management actions to correct unfavorable trends. Repair cycle assets represent a small percent of the total line items in the supply system, but comprise the largest percent of the total dollar value of the items. The Air Force has an enormous dollar investment in repair cycle items, and as such, the importance of control of these items cannot be over emphasized. Complete control over repair cycle items must be maintained at all times. Repair cycle items will be carried on supply records in the serviceable or Due In From Maintenance (DIFM) balance of the item record. Accountability of repair cycle items is retained regardless of location. However, the most important and difficult time to control repair cycle assets is when the items are in maintenance shops for repair (11:56). A DIFM record is created when maintenance personnel request an issue of a repair cycle item other than initial issue. Control of the repair cycle item in maintenance begins with the issue of the item and terminates when the removed item is repaired on station, shipped off base, or condemned, and the appropriate supply records are updated.

Supply and Maintenance personnel should realize what usage data such as demands, reparable this station (RTS), not reparable this station (NRTS) and condemnation (COND) along with repair cycle time are used to develop factors for stock leveling. One of the ways a maintenance activity can help to ensure that usage data for repair cycle assets is accurate

is through the processing of Maintenance Turn Around update (TRN). The importance of processing TRN cannot be over-emphasized. The processing of a TRN updates demand data on the item/repair cycle record and occurs when a repair cycle item is repaired in maintenance and is not physically processed through base supply (28:p.17-7).

A coordinated effort between supply and maintenance personnel is vital for the effective operation of the repair cycle support program. Daily contact between the Repair Cycle Support Unit and the appropriate maintenance function is necessary to ensure orderly, expeditious, and continuous flow of reparables through the repair cycle. The DIFM Listing, R26, is one of the most important management products to assist in monitoring and controlling the flow of DIFM items. The R26 provides for the reconciliation of DIFM record balances with applicable maintenance activities. The listing indicates the number of delinquent DIFM along with the total DIFM items issued and from the data provided, a delinquent DIFM rate can be computed. The delinquent DIFM measures the relative number of reparables in maintenance shops over a specified number of days. Personnel should be concerned with the rate of delinquent DIFM, but should not let this factor alone be the driving force for managing the overall repair cycle program. There are several ways the DIFM status can be manipulated and as such indicate a favorable delinquent DIFM rate; however, this type of action takes

the integrity out of the system. Delinquent DIFM should be analyzed using an item analysis approach as this approach may be helpful in providing the underlying causes of DIFM delinquency. These causes range from insufficient manpower in the maintenance shops to the situation where the contractor is not picking up recappable tires from transportation until there is a specified number of tires available.

Finally, management should give particular attention to reusable containers and their impact on the entire repair cycle control program. The nature of most repair cycle items requires that they be packaged in such a manner as to prevent damage in shipment and storage. A significant cause of damage or destruction of expensive repair cycle items has been due to the inadequate substitution of containers which do not provide sufficient protection. The bottom line is that sufficient quantities of reusable containers must be retained for use in handling, storing and shipping of repair cycle items.

Computer Utilization

The operating efficiency of the UNIVAC 1050-II computer system impacts on the level of customer support provided by base supply. Therefore, maximum computer performance should be of prime concern to all supply managers. Computer utilization, which measures how the computer is being used and how often it is operable, is the indicator for measurement of UNIVAC 1050-II performance. Several areas

impact on this indicator and should be analyzed to determine if a problem exists so that corrective action can be taken. The area of chargeable reruns might be used to help identify a need for additional training for computer operators. A chargeable rerun occurs when there is a rerun or restart of a program prior to its completion because of human error. Therefore, a large number of chargeable reruns caused by newly assigned unskilled operators or a general lack of attention by operators may indicate a need for additional training. Requirements for training should be coordinated between the Supply System officer and Supply Training to ensure the necessary training is accomplished.

Other areas of concern to supply managers include the preventive and remedial maintenance areas. Preventive maintenance is scheduled maintenance that is performed to keep the computer operational. This type of maintenance when performed daily may help to ensure continued serviceability of the computer components such as the printer, reader, or file loader. Remedial maintenance on the other hand is unscheduled maintenance required to correct a computer malfunction. A large amount of time devoted to this type of maintenance may indicate that more time should be spent toward programmed or preventative maintenance. As a final comment, the correctness of the manually prepared computer maintenance record is only as accurate as the computer operators desire it to be.

A related area concerns the products, reports, and listing produced by the computer. There should be a thorough awareness and a knowledge by personnel of the computer products being produced, especially those pertaining to their functional area. At times, supply personnel will request a special utility (ØØ8) report or product to provide data to accomplish a specific task or project. The requested data, in many instances, may already be available in existing reports and listings. Many sections in supply still receive multiple copies of reports and listings when only one copy is actually required and used. Another situation occurs when sections receive reports or listings daily but the personnel only need to use the particular computer product once a week. The examples cited above illustrate the importance of the supply management involvement in the computer operations area as the cost of paper has increased significantly in recent years. Due to funding limitations continually imposed, personnel should continuously evaluate their requirements for computer products. A concerted effort is required to make use of available products and to reduce or hold to a minimum the number of copies and special utility reports and listings. Finally, the aspects of awareness of the capabilities of the computer and involvement by the management cannot be overemphasized. This is of utmost importance to aid in management decisions to ensure the best utilization of available manpower, time, and money.

Coming Changes

The management indicators analyzed in this paper are the common indicators in use at the time of the writing of the paper. The authors realize the supply system is very dynamic and changes in the indicators, potential causes for adverse conditions, and corrective actions will probably be the rule and not the exception.

The Air Force Data Systems Design Center will soon implement four new measures of supply performance. These are gross and net availability, reasons for nonavailability, average inventory investment, and average customer wait time (29:9). These four categories will be stratified by economic order quantity and repair cycle items. A detailed explanation of these new management indicators is contained in the January 1981 through March 1981 editions of the "Selected Item Review." This section will relate the new indicators to the indicators analyzed in this paper.

Gross and net availability relate to the stockage effectiveness indicator discussed earlier. Gross availability measures "the percent of total demands received (includes both stocked and nonstocked items) that are satisfied from stock on hand at the supply activity [30:2]." It is equivalent to the M32 measurement of issue effectiveness. Net availability measures "the percent of total demands received for stocked items that are satisfied from on hand assets at the supply activity [30:2]." This is equivalent to

stockage effectiveness. The indicators will be stratified by operational and support categories where operational category is equivalent to the maintenance organization's stratification of the M32 and support categories includes all other organizations. One important change from the M32 customer support effectiveness categories is the inclusion of Base Service Store items into the measurement of one category of support effectiveness. The effectiveness of supply support in this area has not been measured in the past.

The next indicator is the reasons for nonavailability. This indicator "defines the reason why a customer demand was not satisfied [31:7]" and corresponds to the M32 due-out cause code indicator. The new indicator is divided into four subcategories. The nonstock first time demand category relates to due-out cause code A. The nonstock demand history exists category relates to cause codes B, C, and D. The full-stock insufficient depth categories relates to cause codes F, G, and R. The less-than-full stock category relates to cause codes J, H, and K.

Another indicator, which was badly needed, is the average customer wait time. This indicator measures the "average time in days required to satisfy customer demands [31:7]." There is no corresponding indicator presently available that measures this area. The indicator is subcategorized by operational or support organizations, primary source of supply, requisition priority group, and reasons

for nonavailability. This indicator should provide excellent information to the manager in evaluating delays in receipt of assets.

The fourth indicator is the average inventory investment which "provides the dollar value of the inventory investment for repair cycle and EOQ [32:9]" items. The indicator is categorized by dollar value on-hand, due-ins, and due-outs and by the reason or basis for stockage in base supply.

These indicators should provide excellent data for the supply manager. Gross and net availability and reasons for nonavailability are basically just new formats of old indicators yet the new formats should provide more meaningful management information. The average customer wait time is an indicator which contains information that has badly been needed by the supply manager. The average inventory investment indicator is a reformatting of data from the M20 report into a usable format for management review.

Conclusion

This chapter presented a detailed analysis of 16 supply management indicators. The analysis covered a description of the indicator, a discussion of its importance to the supply system, some potential causes of unfavorable trends, and recommended management actions to correct unfavorable trends. Several pages were also devoted to

four more indicators that will be available for management use beginning in mid-1981.

The 16 indicators chosen for study represent a broad cross section of the supply account and are common in one format or another to the Military Airlift Command, Strategic Air Command, and Tactical Air Command, and Air Training Command. Although there are other indicators of importance to the supply manager, the number of indicators analyzed in this study was constrained by the time limits imposed for completion of the study. The potential cause of unfavorable trends discussed for each indicator are not exhaustive; they include, however, the major problems that may be occurring.

The authors hope this study will stimulate further research into the field of supply management indicators. There is a very real need for detailed analysis of management indicators. These indicators are the measurement of the performance of the base supply operation. Yet, many new supply officers do not understand the information being provided by the indicator. This study of 16 indicators provides the beginning of what hopefully will be a comprehensive handbook of supply management indicators.

CHAPTER VI

SUMMARY AND RECOMMENDATIONS

Summary

Thirty-five percent of all Air Force supply officers assigned are lieutenants or rated supplement officers. These officers, newly assigned to the supply career field, are filling branch chief or, in some cases, chief of supply positions with little or no experience in supply management. Their primary job as supply managers is the overall management of the organization which entails reviewing management indicators and taking effective corrective action when needed. Yet, there is no single reference available for the new manager's use to aid in the understanding of what the management indicator is measuring and what action to take when unfavorable trends exist. This study provides that reference and also provides the foundation for expanded research.

The objectives of the study were to develop the foundation for a supply manager's handbook which would define the objectives of a management analysis program and how management indicators should be used in the program, identify and explain a set of common management indicators, and identify corrective action to be taken when the indicators reflect unfavorable trends. The objectives were achieved by answering five research questions:

1. What are the objectives of a management analysis program?

2. How are management indicators used in an analysis program?

3. What are the common indicators presently being used?

4. What are the formulas used to compute the indicators?

5. What action should management take when the indicators reflect unfavorable situations?

Chapters I, II, and III discuss the background for development of the research questions and the methodology used to answer the questions.

Chapter IV, Developing a Management Analysis Program, and the literature review answered research questions one, two, and three. This chapter discussed the objectives and components of a base supply management analysis program along with the use of specific management indicators in the analysis program. Management Indicators presently being used by the four major commands surveyed are presented in Appendix C. This chapter is important to the new supply manager as he should be contributing to decisions on the objectives and components of the analysis program.

Chapter V, Analysis of Supply Management Indicators, answered research questions four and five. The chapter presented a description of 16 management indicators, their

importance to the supply system, potential causes of unfavorable trends, and recommended management actions. The importance of this chapter to the new supply manager cannot be overemphasized. The manager is expected to review pertinent management indicators and take action to correct problem areas. If the manager does not comprehend the information being presented by the indicator or does not know what corrective action to take, problems will continue. Chapter V provides the basic information needed for the effective management of the supply areas represented by the 16 indicators.

Recommendations

The authors believe the analysis portion of this study should be published into a handbook and distributed to all new supply officers. We have learned from our own personal experience of the need for such a handbook. The high proportion of lieutenants and rated supplement officers assigned to the supply career field further support this need.

The authors also believe this study should serve as a catalyst for further research. Sixteen management indicators were analyzed in this study but other indicators await review. Further input may come from future students of the Air Force Institute of Technology, but the authors hope this study will stimulate research and contribution by the large number of supply officers, noncommissioned

officers, and civilian personnel working in the supply field. Further study may also provide new and more meaningful management information systems.

The need for a comprehensive handbook on supply management indicators is apparent. We have provided the foundation for the handbook and challenge other supply personnel to continue the research.

APPENDICES

APPENDIX A

GLOSSARY

Backorder/due-out: That portion of requested stock which is not immediately available for issue or delivery to the requesting activity and is recorded as a commitment for future issue [5:58].

Bench Stock: A stock of consumption type supplies and parts established at a near point of consumption to ensure continuous and uninterrupted operations [5:65].

Bench Stock Minimum Reserve Authorization: Used to establish bench stock levels for items not justified for bench stock by normal consumption pattern.

Budget Code: A one digit alpha/numeric code used on the item record to determine centrally procured, investment or stock funded items [28:p.3-3].

Cannibalization: The authorized removal of specific components from one item (i.e., aircraft, vehicle) for installment on another item to meet priority requirements with the obligation of replacing the removed components [5:74].

Common Management Indicators: Judgementally chosen by the authors after review of indicators used by the four major commands. These indicators reflect a broad spectrum of the base level supply operation.

Condemned: That condition of an article which makes it unsuitable for restoration to a serviceable condition or of further value to the Air Force in the function for which it was manufactured or authorized [5:99].

Demand Level: A requirement for stock based upon demands by the customer (5:138).

Due-In: The quantities of material expected to be received as a result of requests submitted by base supply to the wholesale source of supply (5:158).

Due-In From Maintenance: A recoverable item flowing or moving through the maintenance shops from the time of removal to actual turn-in to base supply (5:159).

EOQ Asset: An item which cannot be economically repaired by a base or depot maintenance activity (28:p.11-3).

ERRC Code (Expendability, Recoverability, Repairability Category Code): Either a single digit or three digit supply oriented code used to classify Air Force items of supply into various categories for management purposes [5:177].

Excess Exception Code: A one digit alpha or numeric code which is used on the item record to identify items which are not subject to normal excess reporting [28:p.11-36].

File Status: The review by the computer of the entire item record area each ninety days for the purpose of updating the item record demand levels, identifying excesses, and deleting inactive item records [28:p.11-10A].

Fiscal Year: The period from 1 October through 30 September. The fiscal year is designated by the calendar year in which it ends; i.e., the fiscal year 1981 is the year beginning 1 October 1980 and ending 30 September 1981 (5:187).

Fund Requirement Card (FRC): An output for a manual review and determination of requisitioning action when an item fails to pass a Material Acquisition Control Record (MACR) edit.

Issue: To furnish materiel to consumers or users from stock [5:233].

Item Record: A record established at base supply for each item being managed.

Line Item: A complete descriptive entry on any document, including quantity, unit of issue, stock or part number, and all data necessary to positively identify a specific article [5:245].

Management Analysis: A system designed to prepare analysis and make preparations of summary data in order that the commander and staff may be provided with information by

which they can better manage the operation of the unit as a whole [34:6].

Management Indicators: A performance measure which has been determined to represent a key result and which is selected for monitoring at staff and command level incidental to the system for management control [33:p.1-1].

Management Information System: An orderly and disciplined accounting and reporting methodology, usually mechanized, which provides for the accurate recordation of data, and the timely extrapolation and transmission of management information used in the decision-making processes [5:266].

Materiel Acquisition and Control Record (MACR): A control record within the computer which adjusts and precludes automatic requisitioning of materiel.

Mission Capable: An aerospace vehicle or selected item of equipment status indicating the vehicle can perform all of its assigned missions.

Not Mission Capable Both (NCMB): Occurs when the aircraft, missile, or similar weapon system cannot perform its primary assigned mission due to both lack of parts and maintenance repairs.

Not Mission Capable Supply (NMCS): The failure of an aircraft, missile, or similar weapon system to perform its primary assigned mission due to lack of a specific part or component [5:299].

Not Repairable This Station (NRTS): A status condition determined during shop processing of an item used to indicate that the item cannot be repaired at base level due to lack of authorization, technical skills, parts, facilities, manpower, or any other causes [5:299].

Performance Measure: A statistic that is used to compare actual performance with a planned performance to determine the degree of progress toward an objective [33:p.26-1].

Priority: A preferential rating assigning the importance to a request for an item of supply.

Priority Requisition: A requisition having a predetermined degree of precedence over other requisitions [5:336].

Releveling: A requirements scan process of the asset position to determine if a requisition or an excess report should be submitted or if a demand level should be established.

Repair Cycle Asset: An item of durable nature which has been determined by the application of engineering, economic, and other factors to be the type of item feasible for

restoration to a serviceable condition through regular repair procedures [5:377].

Repair This Station (RTS): A status condition indicating that a repair cycle item can be repaired at base level.

Requirements Computation: The computer comparison of total assets to the total requirement to determine if a requisition is needed.

Requisition: An authoritative request or demand for supplies directed to military or GSA materiel management agencies [5:383].

Requisition Exception Code: Assigned to item records to suppress automatic requisitioning action, to identify requisitions requiring external review before submission, or to override certain requisition data (28:p.6-22).

Requisitioning Objective: The maximum quantity of materiel to be maintained on hand and on order to sustain peacetime support objectives for current operations. It consists of the sum of stocks represented by the operating level, safety level, and the order and shipping time, as appropriate [5:383].

Routing Identifier: A three-position code which identifies a specific supply and distribution organization as to its military service or governmental ownership, and its geographical location [5:392].

Source of Supply: The designated supply point to which requisitions are sent for supply or for approval and necessary action toward supply [5:408].

Special Level: The quantity required to be on hand or on order for specific purposes, or a level set for the management of the requisitioning objective [5:410].

Standard: That rate of performance which an organization's logistic effort must attain to support mission requirements [5:416].

Standard Base Supply System (SBSS): An automated inventory accounting system designed to provide timely supply support to base level activities. The system uses the UNIVAC 1050-II computer for storage and maintenance of records and for generation of management reports [26:p.1-2].

Standard Reporting Designator (SRD): A three digit alpha/numeric code which identifies the type of aircraft major end item, or system [5:p.3-18].

Stockage Priority Code (SPC): A code used as a decision element in determining the number of demands that an

economic order quantity (EOQ) item must receive in a 365 day time period prior to the establishment of a demand level (28:p.11-11).

Stock Number Users Directory (SNUD): An Air Force central file containing all stock numbers for which participating organizations have established user interest.

Stockout: Occurs when an item requested is not available on the shelf in base supply.

Transaction Exception Code: Used on inputs into the computer for program identification of exception conditions which require specific actions depending on the input and program involved [28:p.3-61].

Turn-around (TRN): An input document used by base supply to update demand and repair cycle data when maintenance repairs and reinstalls a repair cycle item without placing a demand upon base supply.

Type Transaction Phrase Code (TTPC): Designed to further identify the transaction which appears on the document register. The TTPC gives a brief explanation of the transaction [28:p.3-65].

Warehouse Refusal: Occurs when a specific item is required for an issue, shipment, or transfer transaction is not available in its storage location due to exhaustion of stock or other reasons (5:473).

APPENDIX B

MANAGEMENT INDICATOR DATA

STOCKAGE EFFECTIVENESS DATA

Month	Maintenance Organizations	Recoverable Items	EOQ Items	Overall Effectiveness
October	82.6	73.8	84.5	82.4
November	82.9	73.8	84.7	82.7
December	82.9	74.3	84.9	82.9
January	83.9	75.9	85.5	83.9
February	83.2	74.6	85.2	83.3
March	82.8	74.3	84.8	83.0
April	82.5	74.2	84.6	82.8
May	81.5	72.6	84.3	82.3
June	82.1	73.1	84.5	82.4
July	82.3	72.2	84.8	82.5
August	82.2	71.3	85.0	82.5
September	82.7	71.4	85.3	83.0

Total fiscal year 1980 data in percent for MAC, SAC, TAC, and ATC.

ITEM RECORD WITH A REQUISITIONING

OBJECTIVE AND ZERO ASSETS

Month	Percentage
October	13.3
November	12.1
December	12.0
January	12.8
February	12.7
March	13.2
April	13.1
May	14.0
June	12.8
July	12.6
August	13.0
September	14.0

Total fiscal year 1980 data for MAC, SAC, TAC and ATC.

BENCH STOCK DUE-OUT RATES

Month	Due-Out Rate	Delayed Due-Out Rate
October	5.7	3.4
November	5.4	3.4
December	5.4	4.0
January	5.8	3.5
February	5.6	3.4
March	7.3	4.3
April	6.7	4.0
May	6.4	4.1
June	6.2	4.0
July	5.7	3.7
August	5.7	3.7
September	6.1	3.8

Total fiscal year 1980 data in percentage for MAC, SAC, TAC and ATC.

PERCENTAGE LINE ITEMS EXCESS

Month	Percentage
October	2.07
November	1.14
December	1.21
January	1.69
February	1.45
March	1.23
April	1.80
May	1.61
June	1.19
July	1.78
August	1.58
September	1.34

Total fiscal year 1980 data for MAC, SAC, TAC and ATC.

MICAP CAUSE CODE DATA

Month	Cause Codes B	H	K
October	16.6	31.0	2.6
November	17.2	32.5	2.6
December	17.5	34.3	2.6
January	18.6	33.3	2.6
February	18.6	31.9	2.7
March	18.0	31.7	2.4
April	22.3	26.8	3.4
May	17.2	31.9	2.5
June	16.7	33.7	2.7
July	16.4	33.8	2.5
August	16.9	33.3	2.4
September	16.3	35.0	2.6

Total fiscal year 1980 data in percent for MAC, SAC, ATC and TAC.

MICAP DELETION CODE DATA

Month	Deletion Codes 0	1	3	7	9
October	5.9	33.1	9.2	16.2	3.9
November	5.3	36.0	8.1	16.1	4.2
December	5.1	37.3	7.8	15.3	4.8
January	6.2	33.0	8.9	17.1	4.7
February	5.2	34.9	8.6	15.4	4.9
March	5.6	33.9	8.4	15.7	4.8
April	4.8	35.3	8.7	15.9	4.6
May	4.9	36.4	8.2	15.1	4.9
June	4.9	35.3	8.5	16.9	4.5
July	4.9	34.4	7.6	17.6	4.8
August	5.2	34.7	7.3	16.7	4.4
September	6.0	36.3	7.5	14.8	4.2

Total fiscal year 1980 data in percent for MAC, SAC, ATC and TAC.

PERCENTAGE PRIORITY DUE-OUTS

Month	Percentage
October	41.0
November	38.1
December	38.7
January	39.0
February	38.3
March	38.5
April	40.3*
May	43.0*
June	37.4
July	38.8
August	38.9
September	38.5

Total fiscal year 1980 data for MAC, SAC, TAC and ATC.

*SAC and ATC data were not recorded because of processing error in AFDSDC program.

URGENCY OF NEED (UND) B DUE-OUTS OVER 60 DAYS

Month	Percentage
October	30.0
November	31.6
December	36.5
January	34.6
February	31.5
March	32.5
April	33.0*
May	34.6*
June	35.3
July	36.4
August	33.8
September	36.3

Total fiscal year 1980 data for General Support Division - Firm Due-Outs for MAC, SAC, TAC and ATC.

*SAC and ATC data were not recorded because of processing error in AFDSDC program.

URGENCY OF NEED (UND) A DUE-OUTS OVER 30 DAYS

Month	Percentage
October	58.0
November	58.2
December	61.1
January	57.6
February	54.6
March	53.1
April	54.2*
May	39.9*
June	54.6
July	49.2
August	48.7
September	49.3

Total fiscal year 1980 data for General Support Division - Firm Due-Outs for MAC, SAC, TAC and ATC.

*SAC and ATC data were not recorded because of processing error in AFDSDC program.

OVERALL URGENCY OF NEED (UND) A AND B

DUE-OUT CANCELLATIONS

Month	Percentage
October	52.4
November	53.6
December	52.9
January	51.0
February	52.6
March	49.4
April	50.0
May	51.0
June	50.5
July	52.4
August	44.5
September	44.7

Total fiscal year 1980 data for MAC, SAC, TAC and ATC.

SERVICEABLE BALANCE WITH NO

WAREHOUSE LOCATION

Month	Percentage	Average Number
October	.03	207
November	.01	86
December	.03	246
January	.02	155
February	.00	64
March	.01	82
April	.01	90
May	.01	150
June	.01	114
July	.02	146
August	.03	196
September	.05	347

Total fiscal year 1980 data for MAC, SAC, TAC and ATC.

WAREHOUSE REFUSALS

Month	Average Number
October	230
November	417
December	294
January	222
February	442
March	260
April	375
May	341
June	255
July	264
August	303
September	300

Total fiscal year 1980 data for MAC, SAC, TAC and ATC.

OVERALL INVENTORY ACCURACY

Month	Percentage
October	95.8
November	94.8
December	93.0
January	94.5
February	94.5
March	94.3
April	94.0
May	94.8
June	94.5
July	94.8
August	94.5
September	94.0

Total fiscal year 1980 data for MAC, SAC, TAC and ATC.

ITEM PAST DUE INVENTORY (365 DAYS)

Month	Percentage	Average Number
October	0.1	935
November	0.3	2114
December	0.1	1081
January	0.1	403
February	0.1	102
March	0.3	2066
April	0.4	3249
May	0.3	2285
June	0.3	2444
July	0.3	2115
August	0.3	2092
September	0.2	1796

Total fiscal year 1980 data for MAC, SAC, TAC and ATC.

REPAIR CYCLE ASSET DATA

Month	Reparable This Station (RTS)	Not Reparable This Station (NRTS)	Condemned (COND)
October	4.0	5.5	8.3
November	3.0	4.3	7.8
December	4.3	3.8	7.3
January	4.3	4.3	7.0
February	3.5	3.3	6.0
March	3.5	3.5	5.3
April	4.0	3.8	5.0
May	3.5	4.0	5.5
June	3.8	3.8	4.8
July	4.0	4.0	7.0
August	3.8	4.0	7.5
September	3.5	3.8	8.3

Total fiscal year 1980 data in days for MAC, SAC, TAC and ATC.

APPENDIX C

MAJOR COMMAND INDICATORS

AIR TRAINING COMMAND MANAGEMENT INDICATORS

1. Mission Capable (MICAP)/Requisition Hour Statistics
2. Engine MICAP/Requisition Hour Statistics
3. Economic Order Quantity (EOQ) Effectiveness
4. Recoverable (Repair Cycle) Effectiveness
5. Support Due-Out Release on Time
6. Overall Stockage Effectiveness
7. AFM 66-1, Civil Engineer, Vehicle Maintenance and Other Organization Stockage Effectiveness
8. Overall Supply Effectiveness
9. Bench Stock Availability
10. Expedite Issue Effectiveness
11. Repair Cycle Effectiveness - Critical Items
12. Repair Cycle Effectiveness Excluding AWP
13. Expedite Requests
14. Investment Inventory Accuracy
15. EOQ Inventory Accuracy
16. Urgency of Need (UND) "A" Due-Out Cancellations
17. Due-Outs over 365 Days
18. Reverse Posts
19. Wash Post Transactions
20. Warehouse Refusals
21. Receipts Not Due-In
22. Equipment Dollar Value Excess
23. General Support Division (GSD), Air Force Stock Fund, Dollar Value Excess
24. GSD Orders versus Sales
25. GSD Aggregate Variance
26. GSD Cumulative Sales Variance
27. Computer Down Time - Remedial Maintenance

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MILITARY AIRLIFT COMMAND MANAGEMENT INDICATORS

1. Not Mission Capable Supply (NMCS)/Partial Mission Capable Supply (PMCS) Delete Code Ø Rate
2. NMCS/PMCS Delete Code 9 Rate
3. AFM 66-1 Stockage Effectiveness
4. Civil Engineer Stockage Effectiveness
5. Overall Stockage Effectiveness
6. Off-Line Special Requisition Rate
7. Priority Requisition Rate
8. Requisition Exception Code (REX) One
9. AFM 66-1 Average Repair Cycle Days
10. Reverse Post Rate
11. Warehouse Refusals Resulting in Inventory Adjustments
12. Supplies Serviceable Balance/No Warehouse Location
13. Item Records Past Due Inventory
14. Repair Cycle Inventory Error Rate
15. EOQ Inventory Error Rate
16. AFM 66-1 Bench Stock Due-Out Rate
17. Civil Engineer Bench Stock Due-Out Rate
18. Overall Bench Stock Due-Out Rate
19. UND A Due-Outs Over 30 Days
20. UND B Due-Outs Over 60 Days
21. UND C Due-Outs Over 180 Days
22. Special Level Rate
23. Receipt Not Due-In Rate
24. Item Records With a Requisitioning Objective and Zero Assets

[18:1]

STRATEGIC AIR COMMAND MANAGEMENT INDICATORS

1. Reverse Post and Inventory Adjustment Data
2. Transaction and Item Record Data
3. Issue Effectiveness
4. Requisitioning Data
5. Repair Cycle Data
6. Stockage Effectiveness
7. Bench Stock Indicators
8. Engine NMCS Ratios
9. Computer Utilization Percentage
10. Weapons System Support Effectiveness Data
11. Due-Out Cause Code and Delete Code Summaries
12. Mission Support Indicators
    a. Aircraft Hours Possessed
    b. NMCS/PMCS Requisition Hours
    c. NMCS/PMCS Ratio
    d. Cannibalization Rates
    e. NMCS Rate
    f. NMCB Rate
13. Weapon System Support Rate

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TACTICAL AIR COMMAND MANAGEMENT INDICATORS

1. Sample Inventory Accuracy
2. Complete Inventory Accuracy
3. Items Past Due Inventory
4. Warehouse Refusals
5. Items with Serviceable Balance and No Location
6. Reverse Posts
7. Supply Items with Minimum Levels
8. Low Demand Special Levels
9. EOQ Issue Effectiveness
10. EOQ Stockage Effectiveness
11. Recoverable Issue Effectiveness
12. Recoverable Stockage Effectiveness
13. EOQ Due-Out Release Effectiveness
14. Recoverable Due-Out Release Effectiveness
15. Delayed Priority Status
16. Delayed Routine Status
17. Bench Stock Due-Outs
18. Delayed Bench Stock Due-Outs
19. Priority Requisitions
20. Base Cancelled Priority Due-Ins
21. Base Cancelled Routine Due-Ins
22. Source of Supply Cancelled Priority Due-Ins
23. Source of Supply Cancelled Routine Due-Ins
24. Special Requisitions
25. Over-aged Supplies Priority Due-Outs
26. Over-aged Supplies Routine Due-Outs
27. Over-aged Equipment Priority Due-Outs
28. Over-aged Equipment Routine Due-Outs
29. Supplies Priority Due-Out Cancellations
30. Supplies Routine Due-Out Cancellations
31. Equipment Priority Due-Out Cancellations
32. Equipment Routine Due-Out Cancellations
33. Delayed Repairs Excluding AWP Time
34. Delayed Repairs Including AWP Time
35. Delayed Not Reparable This Station (NRTS) and Condemned (COND)
36. Average Repair Cycle Days, NRTS, and COND
37. Units Repaired on Station
38. Computer Utilization - Remedial Maintenance
39. Computer Utilization - Preventive Maintenance
40. In-Line Time
41. Inquiry Processing Time
42. Releveling Frequency
43. Follow-up Frequency

44. File Status Quarter Code Currency
45. MICAP Cause Code D, H, and K
46. MICAP Delete Code 9
47. GSD Requisition Objective in Special Levels
48. GSD Requisition Objective On-Hand and Due-In Rate
49. GSD Asset Retention Rate
50. GSD Local Excess
51. GSD Economic Retention Due-In Rate
52. System Support Division (SSD) Requisition Objective in Special Levels
53. SSD Requisition Objective On-Hand and Due-In Rate
54. SSD Asset Retention Rate
55. SSD Local Excess
56. SSD Economic Retention Due-In Rate

[20:7-75]

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